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THE MAGAZINE

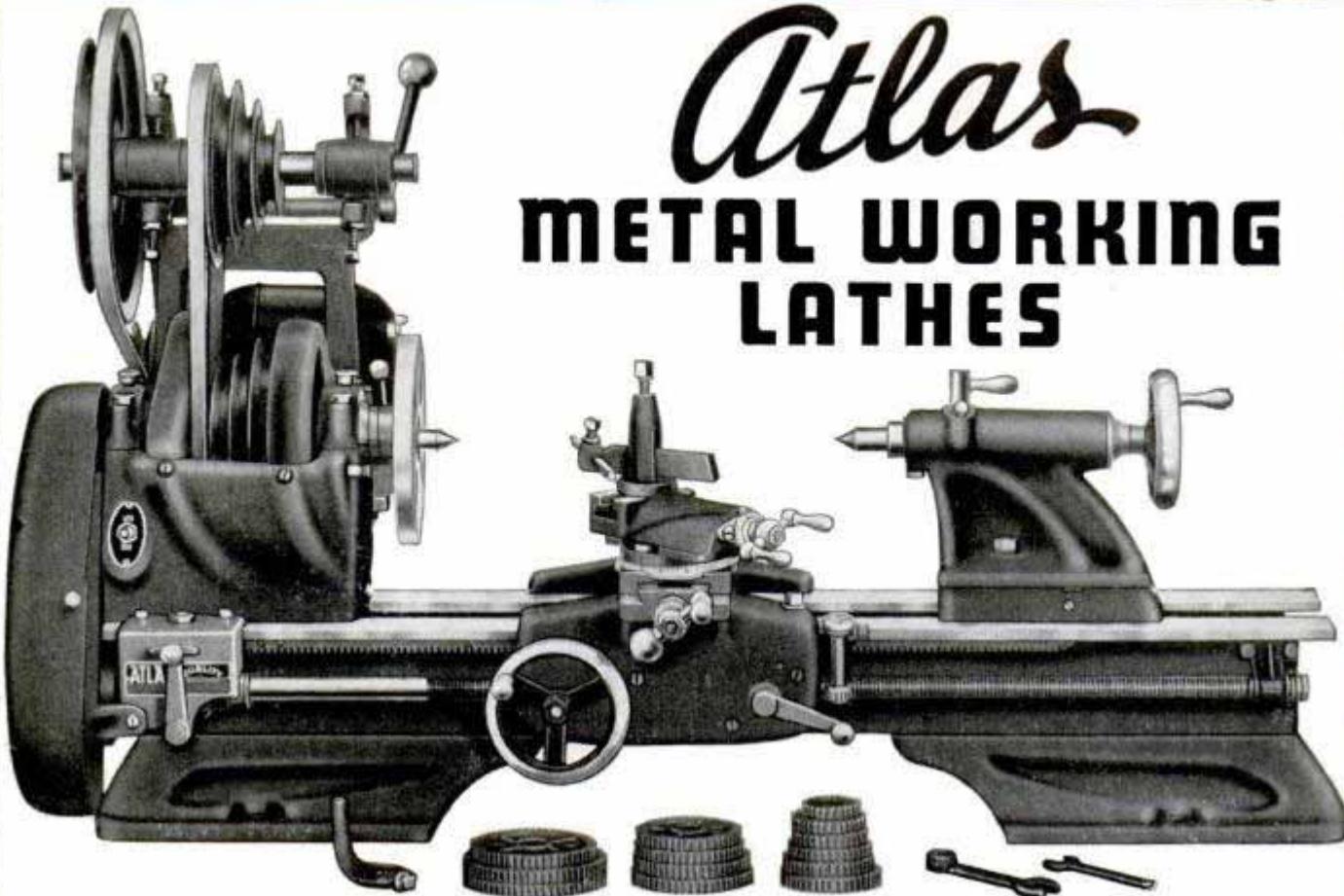
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MARCH
25 CENTS

SEE PAGE 365



Atlas

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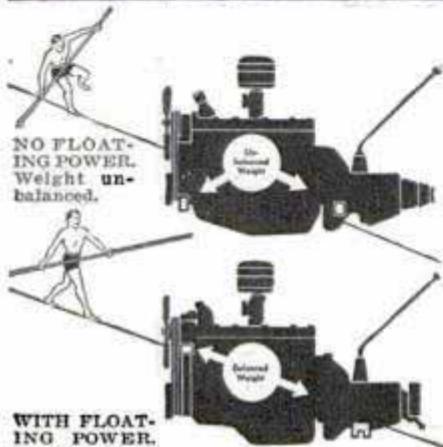
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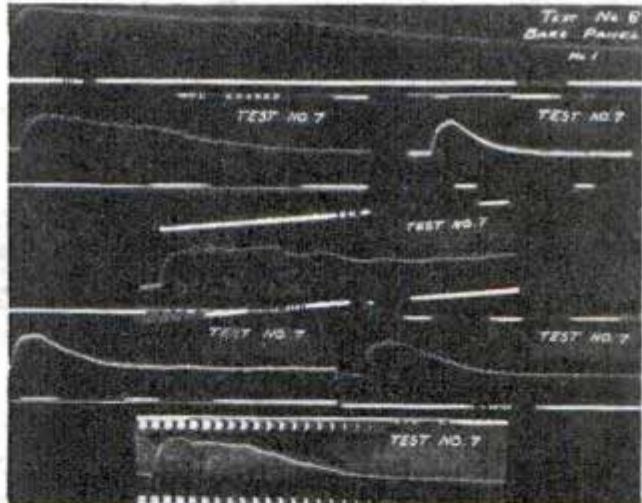
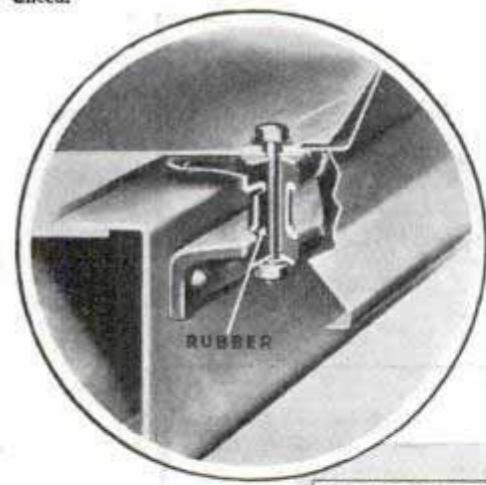
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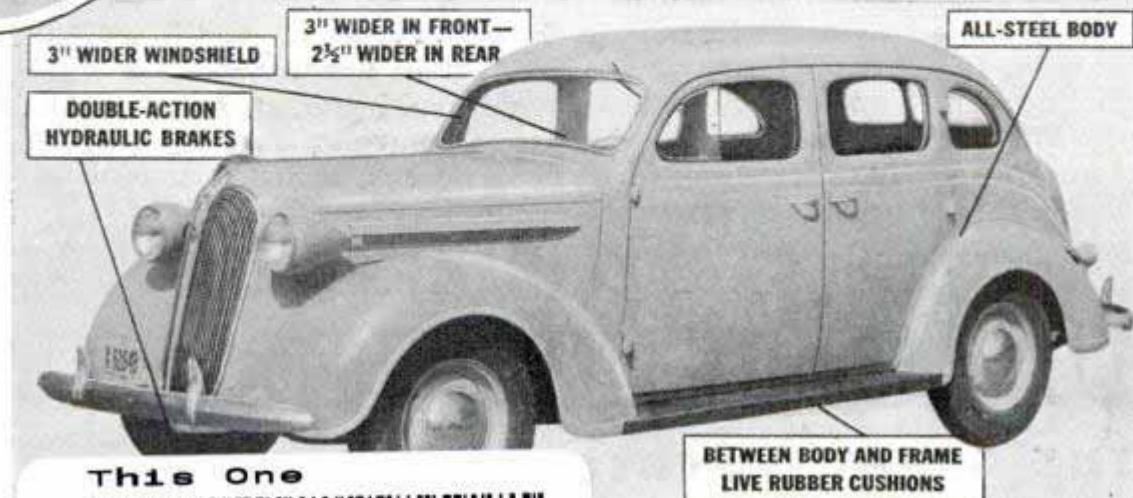
"SOUND MOVIES"... using cathode rays and a special movie camera, engineers took pictures of noise...enabling them to measure its exact pitch and frequency, and learn the efficiency of their new insulation.

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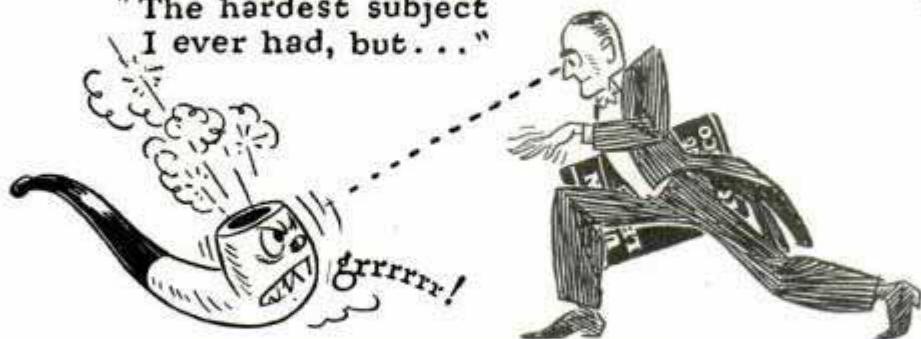
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to soothe
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pipe"



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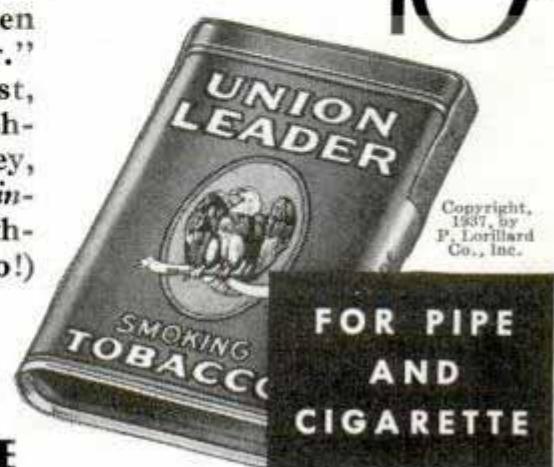


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Popular Mechanics Magazine

H. H. WINDSOR, Founder

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March, 1937

Vol. 67, No. 3

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"Let There Be Light—"

SIXTY years ago a young inventor began seeking a method of "bottling up" electricity to provide illumination. People ridiculed the idea. For two years he patiently tried one process after another. None worked. At last he looped a carbon strand inside a glass bulb from which the air had been pumped. Then he turned on the "juice." And there was light, light in a vacuum, light where everyone said no light could be! The modern electric lamp is many times as efficient as that first lamp of Thomas A. Edison's, but even modern lamps convert only a small amount of current into light. There is still room for more improvement and lamps are being improved each year. Watch next month for the first of two articles on modern lighting. You'll find the story illustrated with eight pages of Coloroto pictures.

Next Month

HOW good a driver are you? How do women compare with men in driving ability? Which would be likely to handle a car best, a youth of twenty-five with five years of experience or a man of sixty-five with forty years of driving? You'll find the answers next month in an article describing the work of the Bureau for Street Traffic Research of Harvard University which has tested the driving reactions of more than 70,000 persons.

Camera Detectives

WHEN things go wrong in industry today, the boss calls for a movie camera. And the camera, peering through microscopes and even looking through solid walls, makes visible things the eye cannot see and frequently locates the trouble. Movie cameras have even photographed what goes on inside an automobile engine. Watch for "Movies That Show the Invisible," in the April issue.

Aerial Daredevils

SPECTATORS at a recent air show saw two planes lock wings and waited breathlessly for the crash. There was none. In a few seconds one ship pulled away from the other. It was all a stunt of a couple of aerial acrobats. An article next month tells you how this trick and many others are performed safely.

DIVIDENDS NEXT SUMMER



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HURRY—AND NED'S NEW
NASH LAFAYETTE HAS
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RINGS



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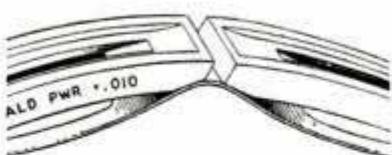
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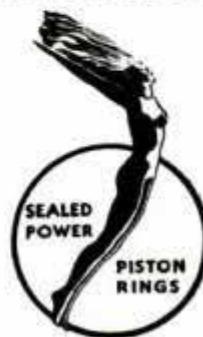
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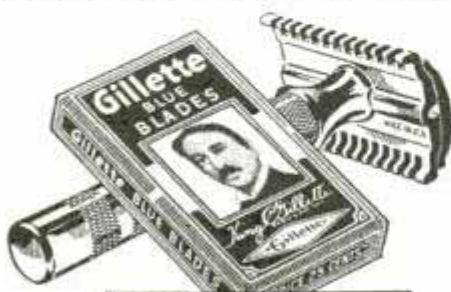
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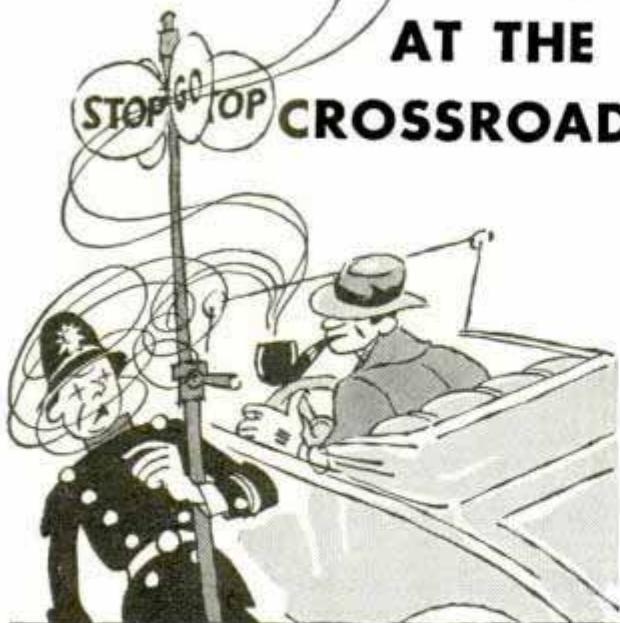
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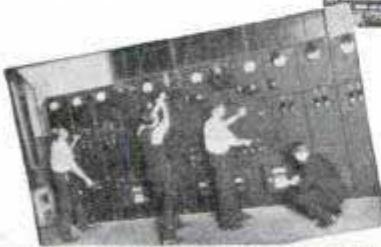
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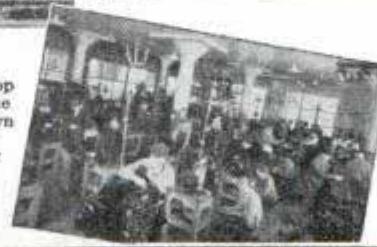
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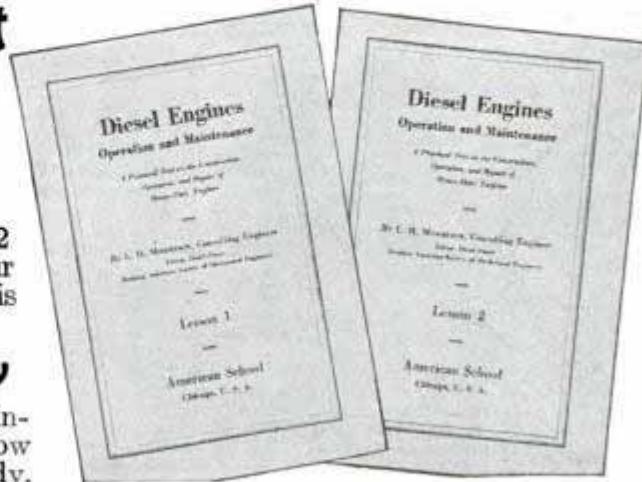
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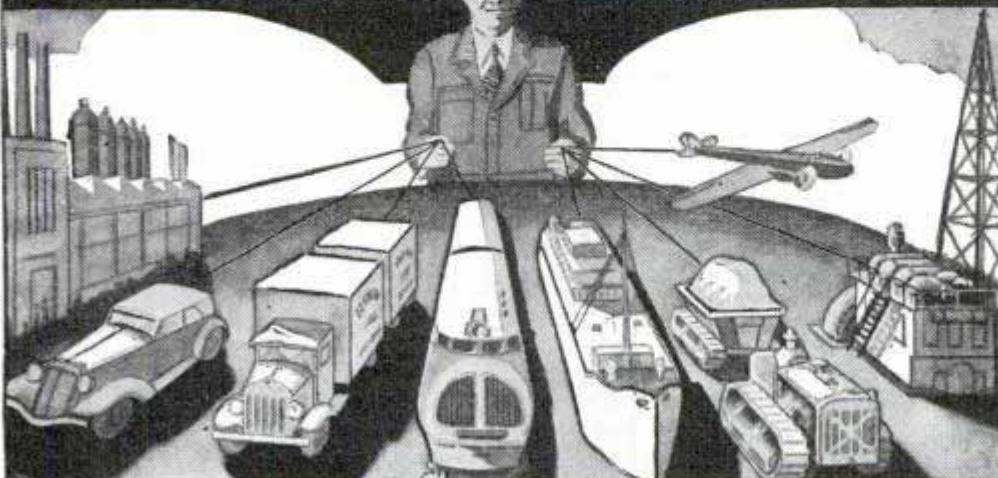
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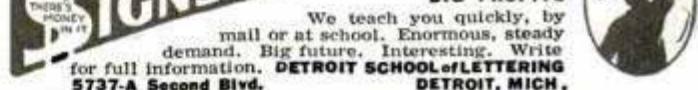
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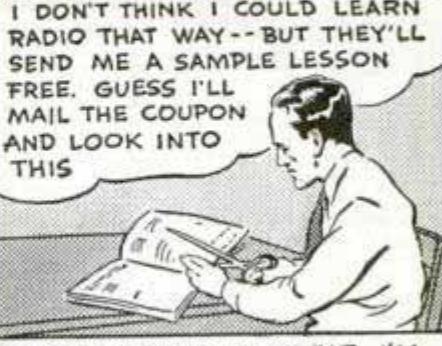
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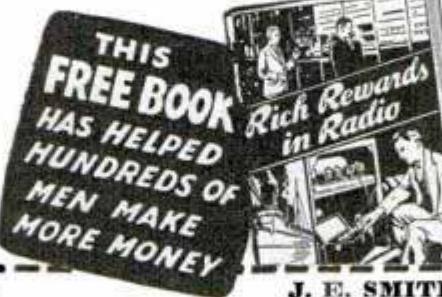
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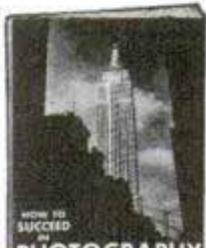
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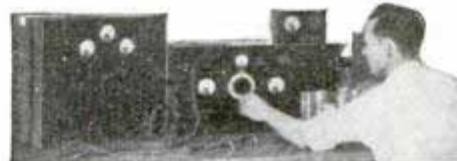
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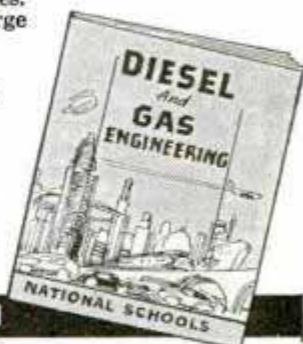
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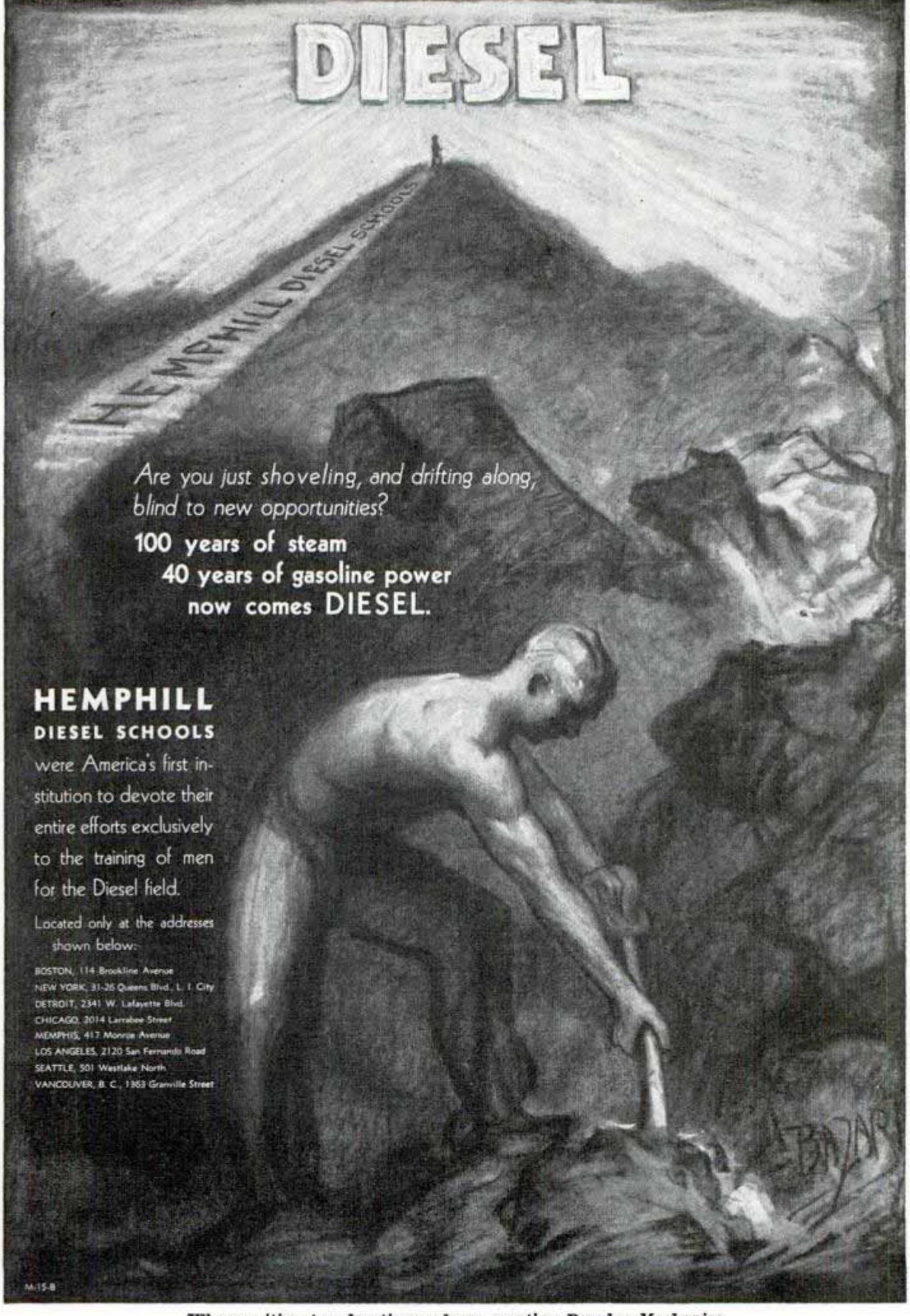
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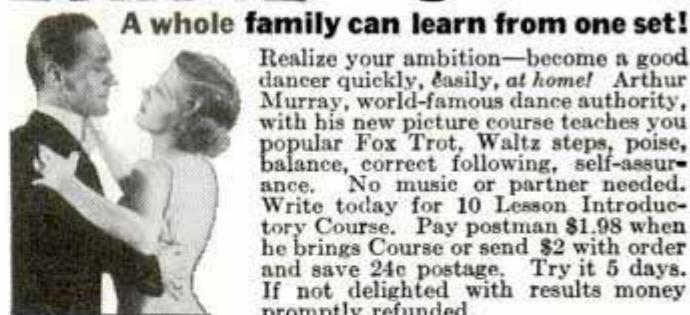
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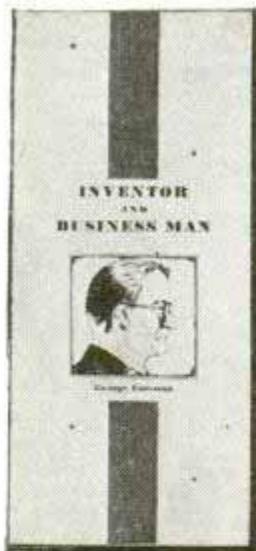
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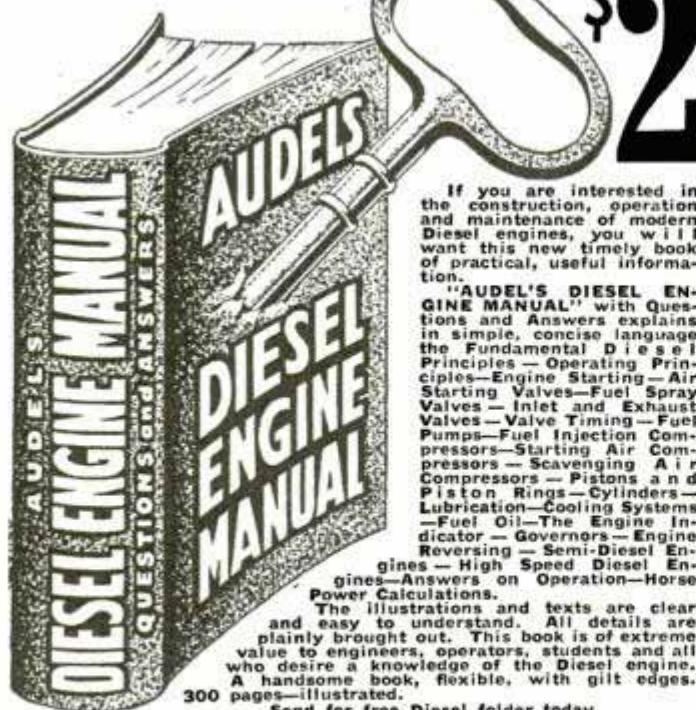
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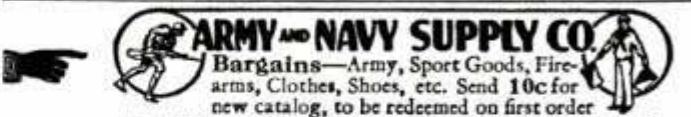
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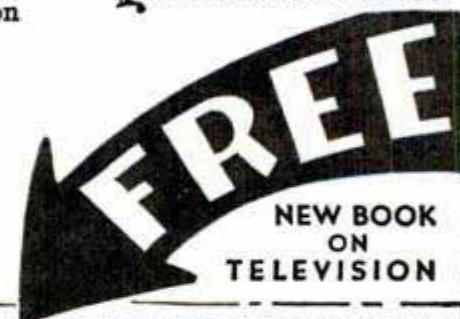
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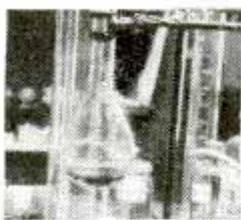
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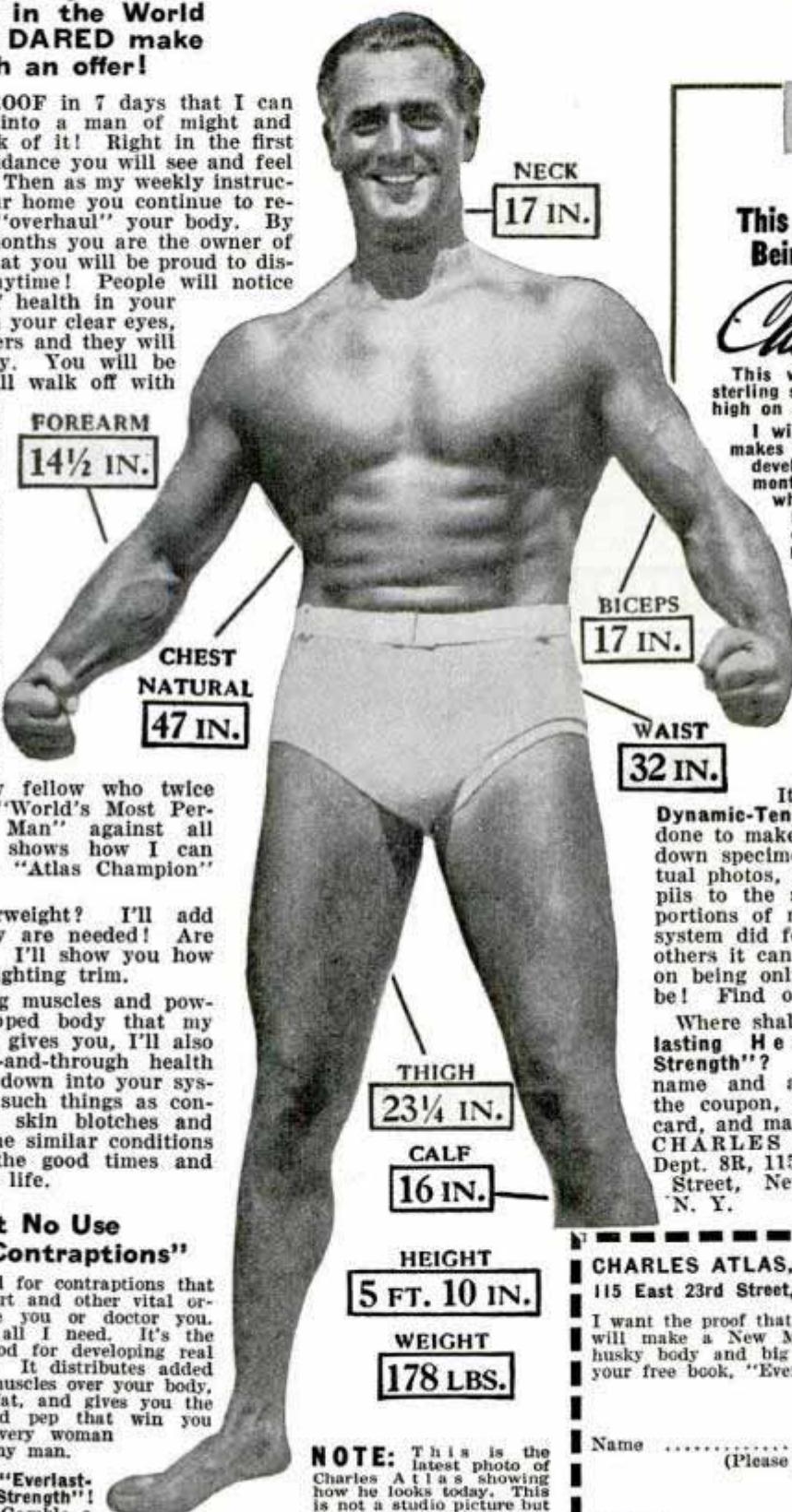
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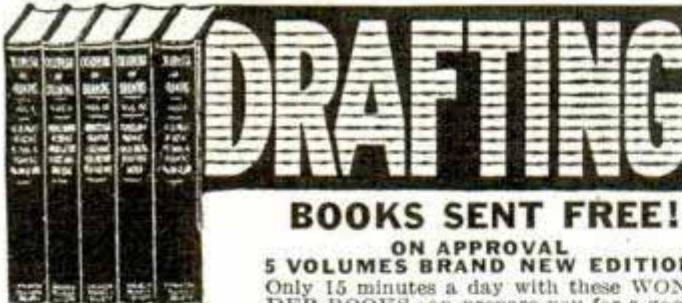


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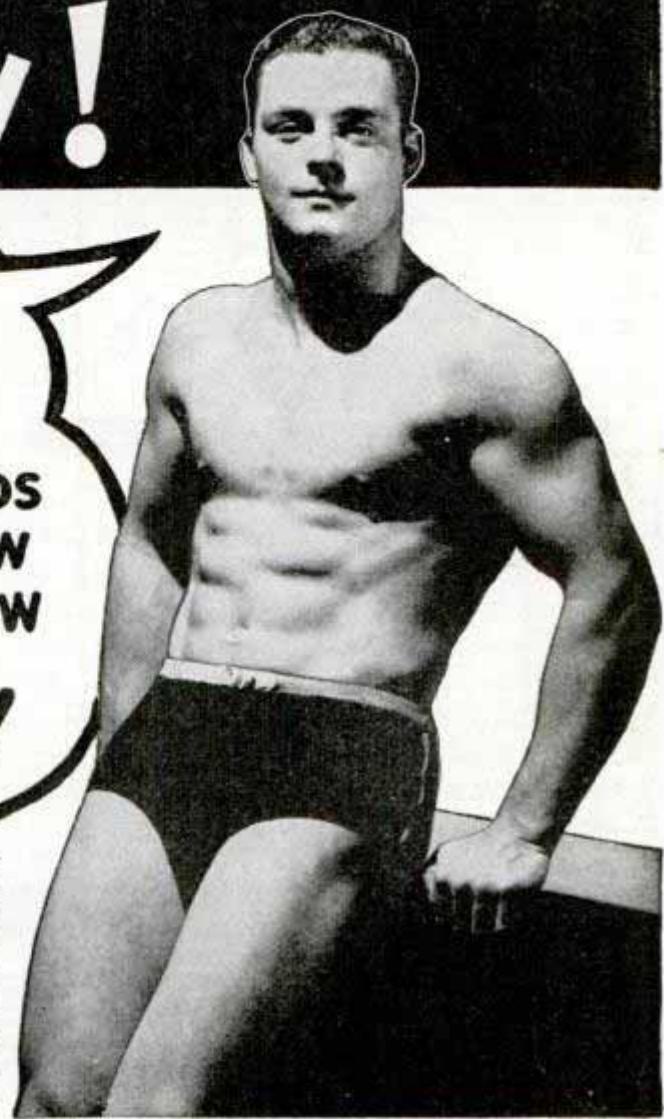
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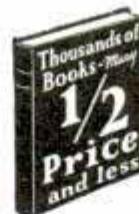
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1904.. and

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By Richard McP. Cabeen

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WHEN stamps were first issued no thought was given to ways of separating them. They were simply printed on a sheet and the user tore or cut them apart. But when stamps came into general use, experiments were made with lines of slits and later with lines of holes between the rows. Nearly all postage stamps have been so treated ever since.

In general, collectors speak of the "separation" of the stamps, with "perforation" applying to all processes which punch out small bits of paper, and "rouletting" applying to any process which cuts slits

without the removal of any paper. Stamps which have not been treated in any manner are classed as imperforated or unperfected. Only a few varieties of perforation are found in modern stamps since nearly all countries use the ordinary punched round holes. In earlier times, there were a few varieties of square and oval shaped holes, and our revenue stamps of the Spanish-American war period used a hyphen hole perforation in which a rectangle of paper was punched out.

In rouletting there is scarcely a shape

(Continued to page 49A)

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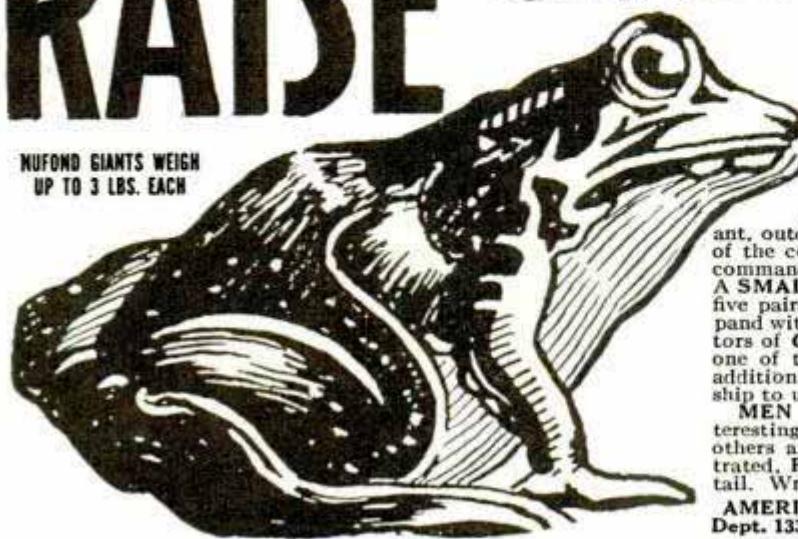
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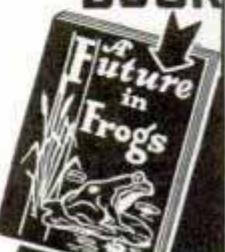
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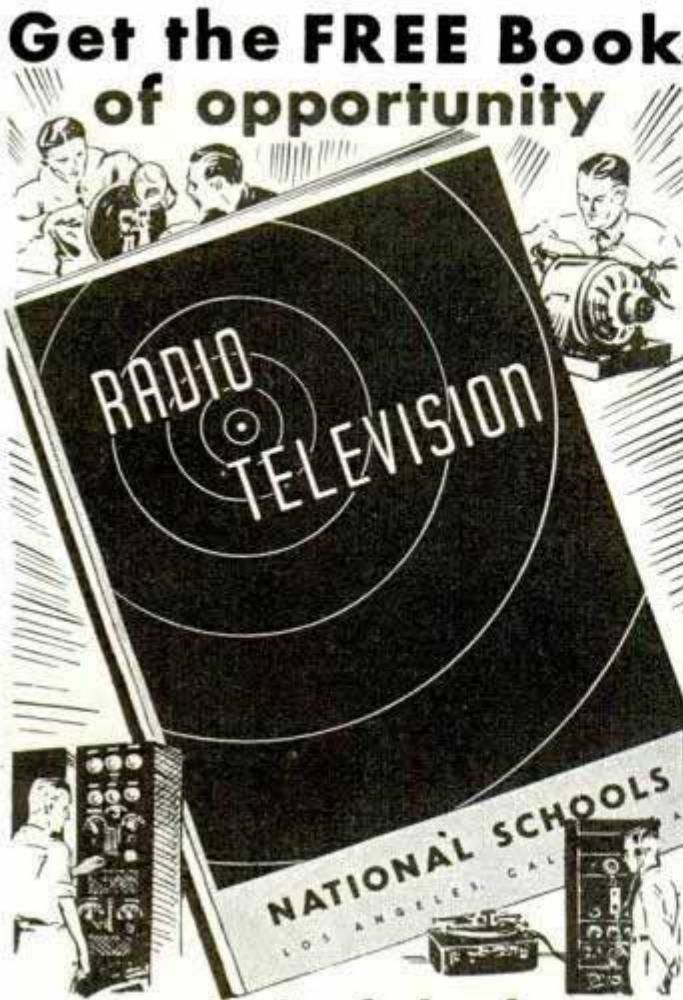
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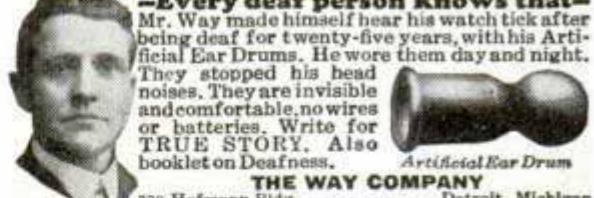


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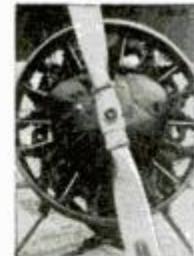
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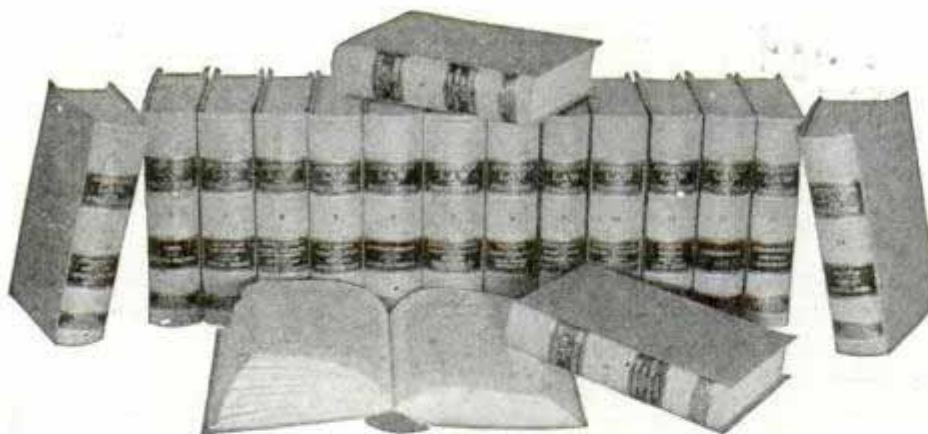
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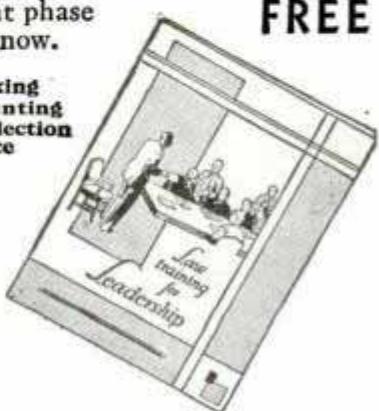
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SAVE Money on radios and parts. Send for our money saving bulletin. United Radio Co., Newark, N. J.

RADIO Engineering, broadcasting, aviation and police radio, servicing, marine and Morse telegraphy taught thoroughly. All expenses low. Catalog free. Dodge's Institute, Ames St., Valparaiso, Ind.

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DUO-FLEX Reeds for clarinets, and saxophones eliminate your reed troubles. Write for circular. Duo-Flex Reeds, 1204 1st Ave., Evansville, Ind.

HAVE Phonograph record made your song. Rainbow Recording Studios, 210 Olive, St. Louis, Mo.

SONG Poems wanted—Home, love, sacred, any subject. Send best poem today for offer. Richard Bros., 24 Woods Bldg., Chicago.

SONGS Published, method, 30 cts. E. Malden, 1017 Danforth, Syracuse, N. Y.

SONGWRITERS! Vital information for stamp. Sudlik, 1813 1st S. W., Cedar Rapids, Iowa.

SONG Poems set to music. Get our phonograph recording plan. Zerse Btgs., 210 Olive, St. Louis, Mo.

REBUILT Band and orchestra instruments. Honestly rebuilt—fully guaranteed. Catalog of new instruments on request. Weymann Company, Dept. M-3, 1613 Chestnut St., Philadelphia.

MUSIC Arranged for songs; orchestra. Frank S. Wildt, Lancaster, Pennsylvania.

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ENTER Monthly song contest. Send lyrics, melodies. Write to Superior Song Studios, Passaic, N. J.

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PLANS. Money makers. Circulars free. Modern, Box 5283, Tampa, Fla.

OBTAIN Capital needed for any purpose. Particulars free. Capital Service, Jefferson City, Missouri.

WRITE For money-making offers. Hollywood News for Ambitious, 5c. MSS-1113, Albuquerque, N. M.

A NATIONALLY Known cleaning product for carpets and upholstery is starting a new field. Cleaning carpets—rugs at home without removing from floor. Cleaning machine and cleaner sent you with small deposit. Guaranteed results. Season just starting. Kleen-Rite, 539 E. 61st, Chicago, Ill.

BUILD Your own business. Small capital required. You've watched the automobile, radio, electric refrigeration, air conditioning. Water softening is next. Get in on ground floor. Wolcott Water Softener, 619 Range Line Street, Columbia, Missouri.

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LIQUID Marble—Anyone can make! Colorful, glazed! Moulded, brushed, sprayed. Rubberlastic moulds. Composition flooring. Big money in these! Particulars free. Marbleizing Service, Edwardsville, Illinois.

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RELIABLE Person each town for your own outdoor advertising business. Experience unnecessary; we teach you. No selling. Good paying business. Dawson's Service, Cape Girardeau, Missouri.

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IF Your business needs capital write Johnson, Bedford Building, Chicago.

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LEARN Modern rent collecting from successful operator. Big pay. All or part time. No investment. Fine side line to real estate or insurance. Circular free. Sirocan, 2038 Oberar, St. Louis, Mo.

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DOLLARS Daily. Start home mailorder business. Details. Duffy, Covington, Ky.

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BUSINESS Of your own. No capital required. Details. Win Service, California, Pa.

500—1936 NAMES Of opportunity seekers 50c. Trial hundred 10c. Carl Edquist, Odessa, Minn.

SUCCEED With your products. Make-sell-them. Formulas. Processes. Accurate analyses. Catalog free. B. Thaxly Company, Washington, D. C.

CHEMICAL Expert furnishes manufacturing formulas with complete working directions. Reliable individual services. Charges reasonable. Dr. VanHeeden, 1410 East 54th, Chicago.

SELL By mail. Books, novelties. Bargains! Big profits! Particulars free. B. Elfco, 438 North Wells, Chicago.

CHARTERS: Delaware; best, cheapest; free forms. Colonial Charter Co., Wilmington, Del.

MANUFACTURE Polishpuffs. Amazing proposition 10c. Particulars free. Hickory Dell, Glenbeulah, Wisconsin.

ARTIFICIAL Marble sanitary flooring. Instructions covering wood or cement flooring $\frac{1}{4}$ inch thick, fireproof, all colors, low cost, ornamental casting, concrete, plaster, papier-mache, garden furniture, statuary, flexible molds, particulars free. Chris Mahler, Elmont, N. Y.

FREE Booklet describes 107 plans for making \$20-\$100 weekly, in home or office, business of your own. Elite Co., 214 Grand St., New York.

MAIL Order business is your opportunity. Many began small, now earn thousands yearly. No personal contact. Boundless opportunities. Have had over 30 years experience; will help you succeed. Send 25c for valuable booklets, none free. B. Breniser, 257 South 21st, Philadelphia.

I WANT To send you proof of the wonderful pulling power of Popular Mechanics Magazine's classified pages. What's your proposition? Write me today. F. W. Johnson, Manager Classified Advertising, 200 E. Ontario St., Chicago, Ill.

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START Little business anywhere. Everything furnished. No canvassing. Maywood, PM-923 Broadway, New York.

YOUR Old plans—regardless of original cost—taken in exchange for my new, original 1000-In-One-Plan. Details free. Write at once. National M. Agency, 2045 Snyder Avenue, H, Philadelphia, Pa.

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FERGUSON Manufacturing Co., 322 N. Senate Ave., Indianapolis, manufacturers of trade stimulators for operators since 1919. Wholesale catalog, 10 cts.

ESTABLISH Permanent well paying first aid supply business with ethical surgical dressings. Needed in every home, office and industrial plant. Exclusive territory open. Amazol Products Co., 5515 South Vermont Ave., Los Angeles, Calif.

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1000 MONEYMAKING Ideas, book 50c; literature free. Harvey Teeple, Decatur, Ind.

WHOLESALE 1937 Buying Guide, 132 page directory listing supply source of 500,000 articles. \$1 postpaid. Associated Products H-3, Box 694, Muncie, Indiana.

FREE Circulars describing hundreds moneymaking opportunities. Wyatt, Box 2322, Houston, Texas.

GIVE Away \$10.00 Clipshave Electric Razors free. Make \$5.00 profit each transaction. Novel, new, self starting proposition. Big money for live wires. Send 10c for sale-card and details. American Novelty Co., 1841 Broadway, New York City.

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BETTER Money making ideas and opportunities. Literature free. Barfield, Box 5032, Metropolitan Station, Los Angeles, Calif.

96 GUARANTEED Moneymaking formulas and ideas mailed, 50 cents coin. Clifford Dunbar, Osgood, Indiana.

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SIGN, Showcard lettering, E-Z method. Instructions 25c. Blake, 1064 Woodycrest, New York City.

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"SNAPPY Service" mail order market, 5c. P. Sidella, Pottsville, Penna.

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PULL in the dollars with the "Money by Mail" system. Particulars free. R. Bowen Company, American Bank Building, Portland, Oregon.

107 PLANS For making \$20-\$100 weekly in home or office business of your own. Descriptive booklet free. Elite Co., 214 Grand Street, New York.

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FIFTY Money-making opportunities, 25c. Carl Greiner, 5112 N. Oakley Avenue, Chicago, Illinois.

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OPPORTUNITIES For money making. Summit Press, Box 123, Jackson, Mich.

MILLIONS Jobless! Get dollars in mail daily, like we do, for amazing employment information (got man 76 jobs). Keep money; we fill your orders free. Stamp brings details. Co-Operative Service, 77 Swan, Buffalo.

BIG Money at home plating auto parts, reflectors, mirrors, chandeliers, by late method. Experience unnecessary. Free particulars. Gunmetal Co., Ave. N., Decatur, Ill.

FORMULAS, PLANS, ETC.

BAR B-Q Sauce, hamburg relish. Sells your sandwiches. Two recipes \$1. Zehnder Sales, Phillipsburg, N. J.

GUARANTEED Formulas—New fast sellers. None better. Lowest prices. Catalog free. Kemico, 49C, Park Ridge, Ill.

FORMULAS—Latest, best selected sellers. List free. Persian Laboratories, Bay City, Mich.

FORMULAS—Newest, profitable, unexcelled. Write for special offers. Philarst Company, Jefferson City, Missouri.

RECLAIM Oil drained from automobiles. Instructions fifty cents. Evans Agency, Montgomery, Ala.

ANALYSIS. Research. Newest guaranteed formulas. Biggest catalog free. Special prices, leads. Gibson Laboratory, Chemists, BD-1142 Sunnyside, Chicago.

AMAZING Formula information! "Lin-O-Uth" body invigorator. "Har-O-Uth" hair revivifier. Davis, Box 1484-A, Clarksburg, W. Va.

DOUBLE Your present income. Buy our up-to-date gold and silver mirror formula. Start making mirrors at once. Instructions complete \$10.00. Nashville Mirror and Sign Co., 179 3rd Ave., N., Nashville, Tenn.

ANY Formula 30c or money back. List free. Ogg's, Tampa, Florida.

BENZOLENE Crystals—Amazing non-explosive chemical cleaner. Formula 10c. Waldo, Box 266, Dallas, Texas.

PROFITABLE. Fast sellers—Best household remedies \$1. Tri City Service, Box 151, Davenport, Iowa.

KEEP Cool without ice. Ice-Ola artificial ice. Keeps food, drinks, etc., cool and fresh. No more ice bills. Few cents to make. Formula 25c coin. Samuel B. George, 285 E. Queen Lane, Philadelphia, Pa.

MONEY Detector. Detects counterfeit money instantly. Simple. Guaranteed. 25c. Morell, 1947 "S." Lincoln, Nebr.

MAKE Own products easy. Profitable. Sylco, 417-P, Downers Grove, Ill.

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CORRECT Formulas. Samples furnished, details free. Box 768, Waco, Texas.

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25 CHEMICALS With experiments, 50c. Kayare Chemical, 5522 P. Ft. Hamilton Parkway, Brooklyn, N. Y.

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CHEMICALS In 5c quantities. Catalog 5c. Fleischer's Laboratories, Everett, Massachusetts.

HELP WANTED

MONEY In butterflies, moths. See Sinclair Display Advertisement on page 20A.

MEN Wanted for coffee routes. Earnings up to \$45 in a week. Automobile given producers as bonus. Write Albert Mills, 2247 Monmouth, Cincinnati, Ohio.

USE \$500.00? Raise canaries for us. Free particulars. Canary Guild, 3741-B, 60th Street, Woodside, N. Y.

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500% PROFIT. Gold reflecting letters for store windows. Large sizes 1c. Free samples. Modernistic Sign, B-3004 Lincoln Ave., Chicago.

STRANGE Ironing cord. Saves electricity. Abolishes scorching and kinking. For telephones also. 150% profit. Sales guaranteed. Big free offer. Neverknot, Dept. 3-A, 4525 Ravenswood, Chicago.

\$6.85 HOURLY! Amazing No-Flatix fixes punctures without patching; makes tires puncture proof! Instantly—permanently seals holes made by nails, etc. Big seller. Free sample offer. No-Flatix, Dept. M-172, Cincinnati, Ohio.

AGENTS—New item for home, store, office. \$1 on every sale. Repeats! United Appliance, 173 Orchard St., Rochester, N. Y.

BIG Suds soap powder. Sample 5c. Manufacturer, 149 Collingwood, Detroit, Mich.

ASPIRIN Agents—Earn more in 1937 with Meihls quality aspirin displays—12 tins 21c each; 36 tins 62c each; bottles 100 tablets \$1.20 dozen. Order today. Private Products Mfg. Co., Dayton, Ohio.

SELL Neon signs. Big profits. Free details. Wholesale Neon Supply, Sheboygan, Wis.

WHOLESALE Catalog free, 500 best sellers. Paty Co., 1167 Broadway, Somerville, Massachusetts.

MONEY In butterflies, moths. See Sinclair Display Advertisement on page 20A.

BIG Money applying gold initials on automobiles. Easiest thing today. Free samples. Also, sideline salesmen for name plates and tire cover transfers. "Ralco," 1084 Washington, Boston, Mass.

400% PROFIT In new self-starting no-flint cigar lighter. Retail 50c. Sample 25c. Get details quick on wonder seller. New Method Co., Box PM-51, Bradford, Pa.

AGENTS. Sales promoters, new fast medicine specialties. Big profits. Samples 25c. Damon Co., Genesee, Ill.

MAKE Your own products. We sell formulas for highest quality toilet preparations, extracts and household specialties. Catalog free. Scientific Laboratories, 1950-W Broad, Richmond, Va.

CHIPPED Glass sign making; mirror re-silvering; metalware replating. Interesting. Profitable. Write Sprinkle, Plater, 128, Marion, Indiana.

5c WILL Make you \$1 profit. Free sample of product, free literature. Stanley Products, Lansing, Mich.

SELL Slogan signs. Free kit offer. Special Kut, Sidney, Ohio.

MAKE 212% Profit! Metalfix—amazing new "metallic liquid" instantly, permanently repairs metal, wood, glass, leather, etc., without heat, acid or tools. Holds forever! Free sample. Write, Metalfix, Dept. M-313, Cincinnati.

AGENTS! Dresses 33c, men's suits \$1.50-\$2.00, shirts 46c, ties 63c, chiffon hose 42c. Amazing prices. Big profits. Catalogue free. Acme, AB-558W Roosevelt, Chicago.

MEXICAN Finest feather pictures, blankets, pottery, carved leather. Free particulars, samples 10c stamps. Apartado 1176, Mexico City, Mexico.

\$5.00 HOURLY. Amazing Karnu refinishes auto like new without rubbing, polishing, waxing or painting. Wipes on with cloth. Lasts 8 to 12 months. Free sample. Karnu, Dept. M-8, Cincinnati, Ohio.

ATTENTION Hustlers, clean up. Costs 10c. Sells for \$1.00. For particulars write J. M. Jones, 724 W. Trade St., Charlotte, N. C.

MONEY??? Sell guaranteed, patented household appliance. 25c brings sample and proposition. Winco, Lodi, California.

500% PROFIT! Gold and colored sign letters for windows, offices, trucks, signs. Monograms. Easily applied. Neonite, Akron, Ohio.

500% PROFIT Selling new "20-in-1" kitchen utensil. Retail 25c. Costs you \$1.00 a dozen. \$7.20 a gross. Sample 10c. New Method Co., PMM-51, Bradford, Pa.

GENUINE Remington portable typewriter for 10c a day! Men wanted to take orders; unusual plan. Famous company will employ new field men. M. N. Rand, Remington-Rand, Inc., 315 Fourth Ave., Dept. C50, New York.

MAKE More money taking orders; shirts, ties, dresses, hosiery, raincoats, uniforms. Sales kit free! Experience unnecessary. Nimrod Company, Department 8, 4922-28 Lincoln Avenue, Chicago.

WOMEN Want "Hande Lingerie Drying Rack." Fits bath tub. Big profits. General Industries, Manufacturers Bank, Rockford, Illinois.

AMAZING New product plates real silver. Big profits—repeat sales. Write quick for free offer. Puritan Laboratories, 1612P Summit, Akron, Ohio.

BIG Profits selling powdered hand cleaners. Sell under your own name. Get our low bulk prices. Kleenslick Co., 1992 E. 5th, St. Paul.

AGENTS Get cash hourly. Thrilling new kind guaranteed silk hosiery plan. Start without experience. Full or spare time. Your hosiery free as bonus. Send size. Rush name. Wilknit, Desk 3B37, Greenfield, Ohio.

GOLD Reflecting window sign letters. Penny each. Large sizes. Easily applied. New styles. Absolutely beautiful. Free samples. Atlas Sign Works, 7941 Halsted, Chicago, Ill.

TRIPLE Your sales with amazing premium plan. Lifetime, 5937 Easton, St. Louis, Mo.

WE Teach you new business, then buy your product. Write Superior Specialties, Springfield, Illinois.

NORWEGIAN-BALM Lotion—A goldmine for agents. Wonderful sales. Unusual lotion for household. Send \$2.50 for sample. Lema Company, Box 214, Arcade, N. Y.

KNITMASTER Knitting machine makes fabric for rugs, novelties, etc. New, profitable. Retail \$4.98. Literature and samples. Ainslie Co., 738 Grand St., Brooklyn, N. Y.

AGENTS. Start exterminating and sales business. Details free. Sanitary Products Company, Box 768, Waco, Texas.

SELL The Driving Master. Shows miles per gallon when driving. Analyzes motor. Described page 369 September Popular Mechanics. Driving Master Co., Sioux City, Iowa.

AUTOMOBILE Parking mirror. Clever new invention. Installed inside car. Prevents damaging fenders, hub caps, tires. Price \$1.00. Auto Parking Mirror Co., 728 S. Hill, Los Angeles, Calif. Sales agents wanted.

MEN—WOMEN \$3 to \$6 daily. Selling 25¢ household necessity that repeats. Three to ten sold in every house. Free sample. Write Puro Company, 3107 Pine St., Dept. C-2047, St. Louis, Mo.

TRANSPARENT Neon-like signs. Cost 4¢—retails 25¢. 1000 designs. Sample and 1937 catalog free. Lowy, Dept. 701, 8 West Broadway, New York.

IF You want a wonderful opportunity to make up to \$7.50 a day—get a brand new Ford sedan as a bonus—be your own boss, write for free details. I send everything you need. Positively no money risk. Albert Mills, 2250 Monmouth, Cincinnati, Ohio.

NEW Cleaner—Amazes everybody. Cleans everything. Washes clothes snow-white quickly. Spots, stains removed like magic. Startling demonstrator. Free samples make fast sales. Quick repeater. Immense profit. Write quick for "free sample." Super-X Cleaner Co., 11, Berwyn, Illinois.

SOCIAL Security ten year record book. Sample 25¢. Triboro Distributors, 3103 30th Ave., Astoria, New York.

"ELECTRIC Powder" cleans, polishes silver, glass, nickel, automobiles, etc. Trial size 10¢. "Neway," 513 Chestnut, Waukegan, Illinois.

625,000 ARTICLES For sale cheap. Lists 10¢. Duffy, Covington, Ky.

MAKE 300%. New! Big demand! Kruft, 13048 Fountain, Springfield, Ohio.

PROFIT With new products. Make, sell, repeat. Analysis. Research. Guaranteed formulas. Biggest catalog free. Special prices, leads. Gibson Laboratory, Chemists, BD-1142 Sunnyside, Chicago.

SALESBOARD Men—New put and take jars. Details, samples free. Tom Thumb, Dept. PM, Nauvoo, Ill.

MEXICAN Feather pictures. Unusual novelty. 50¢ (stamps) bring \$2.00 worth samples, details. Refunded if unsatisfied. Mexican Art, Apartado 1593, Mexico City.

MONUMENTS, Markers, beautiful enduring granites \$8 up. Free catalog, samples. Agents wanted. Mihelich Monument Co., St. Cloud, Minn.

BUY Wholesale 1000 bargains. Catalog free. Products Company, Gary, Indiana.

BIG Money and fast sales. Every owner buys gold initials for his auto. You charge \$1.50, make \$1.45. Ten orders daily easy. Write for particulars and free sample. American Monogram Company, Dept. 40, Dunellen, N. J.

AGENTS: Smash go prices. Santos coffee 12¢ lb., 4-oz. vanilla 8½¢. Razor blades 10 for 8½¢. 100 sticks chewing gum 12¢. 150 other bargains. Premiums. Experience unnecessary. Carnation Co., PO. St. Louis, Mo.

SELL—Blade conditioners—Smoother shaving, millions being sold. Marvelous. Order sample, details quick. Twenty-five cents. Charlton Corporation, Chicago.

SUCCEED With your products. Make-sell them. Formulas. Processes. Accurate analyses. Catalog free. B. Thaxly Company, Washington, D. C.

ENGRAVED Name plates, numbers, signs, etc., easily sold, profits large. Brett Bros., Winthrop, Mass.

MAN In each town to plate auto parts, reflectors, bathroom fixtures, refinish beds, mirrors, chandeliers, by late method; experience unnecessary. Simple plan of manufacturing at home starts you in big money making business. Free particulars and proofs. Gunmetal Co., Ave. H, Decatur, Ill.

FREE Sample—Amazing cleaner; sells homes, taverns, everywhere. Big profit—fast repeater. Betco, 5007 Irving Park, Chicago.

GENUINE Gold letters for store windows. Easily applied. Free samples. Liberal offer to general agents. Metallic Letter Co., 438-B North Clark, Chicago.

SELL Novelty fun cards, novelties, etc. Samples 10¢. National, Box 500M, Cincinnati.

AGENTS: Stamping names on pocket-key protectors. Sample check with your name, address, 25¢. Stamping outfit. Emblem checks, check-fobs, name plates. Hart Mfg. Co., 303 Degraw St., Brooklyn, N. Y.

AGENTS—Opportunity to make money; book containing 107 successful business plans; home or office; send for free introductory booklet. Elite Co., 214 Grand St., New York.

WANTED—District purchasing agents. No experience or money required. Write Purchasing Manager, 174 N. Halsted, Chicago.

COSTS 1¢—Sells 25¢. Make non-explosive cleaner from benzene crystals. 1¢ gallon. Sample 10¢. Literature free. Western Reserve Laboratories, 6615 Denison Ave., Cleveland, Ohio.

DO You want agents for your proposition? Your ad in this space will place your message before hundreds of men seeking fast-selling products. My folder "How to Secure Agents" is filled with proof. I'll gladly send you a copy free. F. W. Johnson, Manager Classified Advertising, Popular Mechanics Magazine, 200 E. Ontario St., Chicago.

PROFITABLE Home business. Legitimate. No canvassing. Maywood Publishers, P-923 Broadway, New York.

FREE! 256 Page wholesale catalog showing 4000 fast sellers from all parts of world. Sporax Co., Le Center, Minn.

HIGH-GRADE SALESMEN

WANT A better income? Wonderful opportunity ambitious, intelligent men. New federal-state tax laws; social security act compel merchants to keep records, file returns, penalties severe! Two-year simplified system including social security records and tax service \$7.95; lowest commission each sale \$4; leads furnished. Protected territory. Amazing self-seller makes sales for you. Live wires average \$100 weekly commissions. Dept. PM-1, Income Record Publishing, 480 Canal, New York.

IMMEDIATE Openings for ambitious men! Wear, introduce "Fairbanks" tailored-to-measure clothes, make up to \$10 in a day. Experience unnecessary. Bonus suit offer. Low prices. Quick sales. Free outfit. Permanent! Fairbanks Company, 2278-A Wabash, Chicago.

MAKE Big money taking orders for men's pants, uniforms, shirts, etc., smashing low prices. Dress pants as low as \$1.95. Biggest cash-in-advance commissions, extra cash bonuses. Free garments to producers. Free complete selling outfit. Rush name on penny postcard. Dunlap Pants Co., Dept. PM-37, Cincinnati, Ohio.

RURAL Men! Manufacturer wants men to take orders for low priced, high quality, guaranteed paint, guaranteed roof coating, motor and tractor oils, and greases sold on long terms. No down payment. Our men earning \$300 to \$800 per month (sworn statement). No investment. E. L. Carter, Box R4306, Fort Worth, Texas.

WE Want ventilating salesmen in every city to sell high grade low priced exhaust fans. Write us today and tell all about yourself. Erie Fan & Blower Co., 122 Church St., Buffalo, N. Y.

BIG Money selling advertising book matches. Amazing low prices. Wonderful full time or sideline. Liberal commissions paid daily. Free elaborate outfit. Regal Match Co., Dept. 53, Hamilton & Gladys, Chicago.

SELL Nothing! \$95.00 weekly. \$500,000 punchboard firm announces new, no investment plan. Season starting, K&S, Dept. C123, 4329 Ravenswood, Chicago.

AMAZING New Tufttwist made-to-measure pants. Smashing low prices. Biggest commissions. Extra cash bonuses. Free pants to producers. Make big money representing old established company. Handsome new spring selling outfit free. Rush name and address. Hutchins Pants Company, Dept. PM-73, Cincinnati, O.

SELL Celluloid and cardboard pricing tickets, steel shelf moulding, changeable signs, menu covers. Every store prospect. P. Pricing Press, 124 White St., New York.

STRANGE Chemical sponge cleans wallpaper like magic. Banishes housecleaning drudgery. Women amazed. Hustlers cleaning up. Details free. Kristee, Dept. 252, Akron, Ohio.

NEW Punchboard line. Free 32 page full color catalog. Nothing to carry. Larger cash commissions daily. Season now! Lea-Moore Co., 180 Adams, Chicago.

SALESMEN—Four \$15 sales to stores net you \$40 daily. Sayers Systems, Est. 1895, 2801-123 Sheffield Ave., Chicago, Ill.

YOU Get paid first. Take orders for 200 home necessities. Pay after you collect. Big profits. Write Ho-Ro-Co., 2792-R Dodier St., St. Louis, Mo.

BE Independent. Own your business; experience unnecessary, selling \$10,000 accidental death, \$50 accident; \$25 sick weekly benefits—\$10.00 yearly. Other amounts proportionate. Guaranteed steady renewal income. \$726,415.63 securities deposited. Universal Policy, 716-A Lefcourt Bldg., Newark, New Jersey.

SELL View post cards. Little competition. Big earnings. Dexter Press, Pearl River, N. Y.

BIG Advertising book match factory offers salesmen amazing full or part time opportunity. Big commission. G. B. made \$77 in 1 day. Fast repeater. Free kit. Match Corp. of America, Dept. E-3, 6041 Grand, Chicago.

NEW Punchboard line. Free 32 page full color catalog. Nothing to carry. Larger cash commissions daily. Season now! Lea-Moore Co., 180 Adams, Chicago.

SALESMEN, Canvassers, male, female, for new patented hot water bottle. Write. Richards Rubber Co., 288 Valley St., Providence, R. I.

SALESMEN. I make \$20.00 daily when I work. Merchants and consumers buy on sight. Write W. E. Bur-Lite, Hudson, Ohio.

MAKE More money taking orders: shirts, ties, dresses, hosiery, raincoats, uniforms. Sales kit free! Experience unnecessary. Nimrod Company, Department 65, 4922-28 Lincoln Avenue, Chicago.

NEW Invention, every market, hotel, cafe, and housewife a sale. 100% profit. Rose Co., 4803 South Sixth St., Louisville, Ky.

SELL Glas-Glo for windows, windshields. Glas-Glo, Phelps, N. Y.

MAN Wanted to supply Rawleigh's household products to consumers. We train and help you. Good profits for hustlers. No experience necessary. Pleasant, profitable, dignified work. Write today. Rawleigh Co., Dept. C-53-PPM, Freeport, Ill.

GOOD Long profit side or main line. Exclusive makers radiator stop-leak and flush. Zenith, 3635-S Lyndale, Minneapolis, Minn.

REPRESENT Manufacturer—Automobile specialty. Write National, P-3-42 East End, Buffalo.

MAN Wanted, by shoe manufacturer established 34 years, for sales work. Ready cash daily and extra bonuses to producers. No experience needed. Your own shoes at factory prices. Sales outfit sent free. Write Mason Shoe Manufacturing Co., Dept. F-8, Chippewa Falls, Wis.

SALESMEN: Sell business cards, lowest prices. Big advance commissions. Free samples. Write S. S. Specialty Company, 611 Madison Street, Oak Park, Ill.

FREE Suits and profits! Do you know a dozen or two men to whom you can sell fine, all wool made-to-measure suits if you show them big savings? If you do you can make easy money for yourself and get your own clothes free. No experience needed. Every garment guaranteed to satisfy. Beautiful outfit—100 big samples—free. Write today! Jim Foster, Inc., 2251-D S. Spaulding Ave., Chicago, Ill.

IMAGINE Going into stores, gas stations, etc., empty-handed and coming out with money in your pocket. New, powerful progressive sales stimulator. Merchants going for it. Fast, advance cash commission getter. Automatically repeats. Average 10 orders daily. Sales outfit free. Melnhardt, Dept. S-7, 18 E. Kinzie, Chicago.

AT Last a new idea in shirts. Rosecliff shirts are worn and endorsed by famous movie stars assuring latest, fastest selling styles. You can make big cash daily. Complete sample outfit free. Write today. Dept. P-3, Rosecliff, 1229 Broadway, New York.

SALESMEN: Take orders—business stationery \$2.65 thousand, book matches, labels, salesbooks, pricing sets. Business cards, 35¢ comm. daily. Free deals. Sales portfolio free. David Lionel Press, Dept. R.K. 312 So. Hamilton, Chicago.

NEW "Sellmore" pricing systems are wanted everywhere. Sellmore, Waynesfield, Ohio.

SELL Only (4) all wool suits to get yours without cost. No limit to number of suits you may earn. Prices \$15.95 to \$28.95. Zipper leather carrying case. Sample line free. No experience needed to make big money. All suits individually cut and tailored to measure. Satisfaction or money back guarantee. Three Star Clothes, Dept. 364, 320 So. Franklin, Chicago.

RADIATOR Stop leak—Guaranteed; fast-selling winter item. Full line automobile tire accessories, with guaranteed 10,000 mile Tiger Grin tire patch. \$75 every week for salesmen-distributors. Write today. Economy Rubber Products, 816 Burkhardt, Dayton, Ohio.

COMPLETE Line private brand auto accessories for wagon jobbers. Exclusive territory. Merchandise stock investment required, with guarantee. W. E. Johnson & Co., Lincoln, Neb.

FLAVOR Concentrates. Add water. Sell large quantities bakeries, restaurants, etc. Concentrated Flavors, 417 First Avenue, Minneapolis.

SALESMEN: Sell advertising novelties, calendars, fans, thermometers, etc., for nationally known firm. Liberal commissions. Stanwood Hillson Corp., 21 Station St., Brookline, Mass.

WE Need experienced salesmen for a real money making article. Wide sales field with exclusive territory. Richmond Chemical Company, Silver Spring, Maryland.

NEW Specialty—Sells every business and professional man. Four \$15 sales daily pay \$280 weekly. Ferrell cleared over \$1,000.00 monthly. Write, F. E. Armstrong, President, Dept. PM, Mobile, Ala.

TRUCK Covers. Complete line waterproof canvas. Thousands of trucks in your state constantly buying. Open price line. No competition. Michigan Tarpaulin Co., Grand Rapids, Mich.

BE Your own boss. Make the largest commissions selling our complete line of brushes. Write for sales plan. Wire Grip Sanitary Brush Corp., 220 Southern Boulevard, N. Y.

BRUSH Salesman—if you ever sold brushes write for our money making proposition. Donald Brush Co., Camden, New Jersey.

FREE Booklet describes 107 plans for making \$20-\$100 weekly, in home or office, business of your own. Elite Co., 214 Grand St., New York.

EDUCATIONAL AND INSTRUCTION

OPERATE A collection business. Be a credit-collection manager. Short course quickly teaches both. Fine income assured. Write Cole Associates, Syracuse, New York.

"SHORTHAND Simplified," complete \$1.00. Free lessons. Satisfaction. Simons, Cromwell, Conn.

KNOCK 'Em cold. Learn police Jiu Jitsu. 13 secret knockout blows without fists. Illustrated course by world famous instructor. Price 15 cents. S. J. Jorgensen, 401 Marquette Bldg., Seattle, Wash.

SPECIAL. Complete up to date automobile course \$15. Bains, 1223 Scott, Kansas City, Kans.

SHORTHAND Brings opportunities. Free catalogue. Shorthand Institute, 6330a Clayton, St. Louis.

SUMMER Hotel positions. Instructions. Richard Lee, 176 Mystic, Somerville, Massachusetts.

AT Last Give yourself a break. Learn forestry at home. Easy. Big salaries. Get new forestry book \$2.75. Wholesale Book Co., Box 365, Altoona, Pa.

BECOME An investigator—Secret service agent. New "Test Problem Method." Develops your ability. Particulars free. International Secret Service Institute, (PM37), Hoboken, N. J.

GOVERNMENT Social security jobs. For men and women, age 18-50. Are you interested in obtaining one? Write immediately for full information and how to pass entrance test, etc. Instruction Service, 101, St. Louis, Mo.

BOOKS Covering hundreds of subjects. Big catalog for 3c postage. Popular Mechanics Press, Room (C37), 200 E. Ontario St., Chicago.

WORK For "Uncle Sam." Many 1937 appointments. \$1260-\$2100 first year. Prepare now for next announced examinations. Influence unnecessary. Many social security jobs expected. Full particulars. List jobs and sample tests—free. Write today sure. Franklin Institute, Dept. A3, Rochester, N. Y.

BECOME Business investigator. Earn \$1.00 hourly, upwards—spare time. Experience unnecessary; we teach you. Details free. Business Detective System, 1009 Oak, Elmira, N. Y.

WELDING. Bumping, metal finishing, torch soldering, taught days, nights. Jobs open. Men from this school getting good jobs right now. Harper Training School, 8807 Harper, Detroit, Michigan.

AIR Conditioning and refrigeration offer greatest opportunities to progressive mechanically minded men. Write for information. Detroit School of Refrigeration and Air Conditioning, 4123 Grand River, Detroit, Mich.

WIN Civil Service position easily through help expert instructors. Graduates hold positions departments Washington, also customs, postal, field service, social security. Ten weeks' course. Prompt information. The Five Tutors, 4 Myrtle Street, Dover, New Hampshire.

BE A radio announcer. Learn at home. Free information. Write Radio Arts Academy, 3819 Wilshire, Hollywood, Calif.

LEARN To dance Waltz, fox trot, tango, continental, Puccinello, truckin', collegiate steps by new chart method at home. Information free! Franklin Publishing Company, 800 North Clark Street, Dept. 2213, Chicago.

NEED Cash? Learn lettering mail \$1 complete course. Northeastern School of Lettering, Box 561, Bangor, Maine.

DIESEL Enthusiasts—Priceless training you can afford. Box 3361, San Francisco.

MEN Wanted willing to learn landscape designing and fill big paying position as landscape architects. Free test of your natural ability and chance to win in \$750 contest. No experience needed to start. Earn while you learn. Write today for free test blank. American Landscape School, 837 Plymouth Bldg., Des Moines, Iowa.

PSYCHICAL Culture Collegium, S. Whitley, Ind. Homestudy doctor degree. Worldwide enrollment.

HOME Study courses leading to degrees: Arts and sciences, philosophy, education, law, letters, theology, psychology, engineering, chemistry, business and commerce. Many others. McKinley-Roosevelt College of Arts and Sciences, Chicago.

SECRET Service. Particulars free. Write immediately. George Wagner, M-2640 Broadway, New York.

BIG Bargain catalogue educational matter 10c. Hanfling, Y-799 Broadway, New York.

HEALTHIANA Scientific divine healing. Wonderful proposition. Healthiana, 3137 Tiffin, Toledo, Ohio.

MASSAGE. Hydrotherapy, dietetics, drugless therapeutics, chiropody, taught by mail. Evans Correspondence School, Montgomery, Ala.

LEARN Machinist trade, tool, die making. Automatic and hand screw machines. Modern shop methods. Actual work. Jobs open for trained men. Employment help. Illustrated booklet free. Allied Screw Machine Company, 901 Lake Street, Chicago.

LEARN Auto mechanics, body, repairing, welding, electricity, refrigeration, Diesel. Stevenson's, 2008A Main, Kansas City, Mo.

LEARN Latest methods solving arithmetical problems quickly. Frederick A. Smith, 2410 Smalley Court, Chicago.

U. S. GOVERNMENT Positions. \$1700-\$1900 and up a year. Let our expert (former government examiner) prepare you for a position in the railway mail service, rural carrier, post office, customs and other branches. Write today for free booklet. Dept. 8, Patterson School, Rochester, N. Y.

PLAYS—STORIES—MANUSCRIPTS

CASH Paid for your story, folk lore, life, nature, legends, ballads, poetry, sports, gardening, sketches, cartoons, photographs, hobbies, puzzles, riddles, friendships, children's bright sayings, baby pictures, humorous stories, cooking and household hints, dogs and other pets, sparetime moneymaking ideas, school, club, church, lodge and benefits derived therefrom and other interesting stories pertaining to home life. Prizes and up to 4c per word will be paid for acceptable material. Send your material today to Home Life Magazine, 6804 Windsor Ave., Berwyn, Illinois.

POETRY: Revision, instruction, sales suggestions. Anton M. Romatka, 25 W. 3rd Street, New York.

STORIES Wanted for sales dept. Also arranging, typing, etc. Crown Service, 917 Shreve Bldg., San Francisco.

STORIES Revised, typewritten, and placed on the market. Details free. Hursh Service, Box 1013, Harrisburg, Penna.

CARTOONING AND COMMERCIAL ART

AMATEUR Cartoonists—Win \$25.00. No drawing ability necessary to win. 26 prizes in all. Rush name on postcard for valuable tips on "How to Make Money With Simple Cartoons," cash prize entry blank and rules. Send no money. Cartoonists' Exchange, Dept. C-23, Pleasant Hill, Ohio.

ATTENTION Professional artists and art students. The mystery of drawing solved. Twenty lessons producing immediate results. Entirely new system. Write Henri Seville Schools, 1530 North Western, Hollywood, California.

CHALK Talks. Laugh producing program, \$1.00. Catalog free. Balda, The Cartoonist, Oshkosh, Wis.

AMATEURS—Make cartoons quick, easy—guaranteed—guarded secrets of professionals. Don't delay. Instructions \$5.00. Amateurs Department, Box 560, Connellsburg, Pennsylvania.

GAG Builder teaches how to create gags that sell. Big field. Big pay. Only course on gag writing. Simple, practical instruction, fully illustrated. Author Don Ush markets your saleable ideas. Free criticism. Price \$1.00. Johnson Press, 443 Wrightwood, Chicago.

AMATEUR Cartoonists earn excellent income, spare time, duplicating cartoons for advertisers. 3-M Service, Arkye, Wisconsin.

18 LESSON Sign course \$1.00. Chalk talking 50c. "Vocational," 3535 Aberdeen, Alton, Ill.

NATIONAL Cartooning Magazine free, sales tips, prizes. Cartoon Publishers, West Springfield, Mass.

CARTOONING Course—30 lessons, over 500 illustrations, drawing pens and pencils, \$1.00 complete. Scovell Studios, Box 748-P, Hollywood, Calif.

CARTOONING, Sketching, etc.—48 lessons, 600 illustrations, including practice sheets, pens, pencils, \$1.00 complete. Fraba Service, Cashton, Wisconsin.

BOOKS Covering hundreds of subjects. Big catalog for 3c postage. Popular Mechanics Press, Room (C37), 200 E. Ontario St., Chicago.

ADVERTISING AGENCIES

INCH Display advertisement 30 magazines year \$24. Wood's Popular Services, Atlantic City, (N. J.)

LEARN Advertising quickly at home. Easy practical plan. No text books. Common school education sufficient. Interesting booklet and requirements free. Page-Davis School of Advertising, 3601 Michigan Avenue, Dept. 3431, Chicago.

ADVERTISE: 24 Words in 250 newspapers \$10. Lists free. Advertising Service Bureau, 4258-C Drexel, Chicago.

ADVERTISING Placed anywhere. Helpful, free service. Rate guide book free. Baker Advertising Agency, 189 W. Madison, Chicago. Successors to Ankrum Advertising Agency. Established 27 years.

ADVERTISE Profitably: \$15 reaches 6,000,000 Sunday newspaper readers with 24 word ad. Newspaper, magazine rate-guide, free. Chicago Union Agency, 20 West Jackson, Chicago.

FREE—New Advertisers Rate Guide, 44 pages. Includes everything. Lowest rates. E. H. Brown Advertising Agency, 140 S. Dearborn, Chicago.

FOR ADVERTISERS

500 PENCILS. Your advertising, \$10.50. Sample 5c. Ad-Craft, Lacrosse, Wis.

DRAWINGS, Lettering, trademarks, letterheads drawn. Send for pricelist. Wilford Glofelter, Spring Valley, Ohio.

24 WORDS, 45 Newspapers \$2.00. Write. Goodall, 742 Market, San Francisco.

25 WORDS, 25 Magazines, three months \$1.50. Empire, Shawano, Wis.

ADVERTISE—3c Word. Meriden Magazine, Des Moines, Iowa. 10,000 circulation. Sample 10c.

BUSINESS SERVICE

MISSING People located. National Agency, Box 3504, San Francisco.

INFORMATION Where to buy anything! Correct addresses of reliable manufacturers, wholesalers. \$1.00. King Buyer's Service, 561 Delaware, Buffalo, N. Y.

NEW York mail address. Business, personal, \$2.00 monthly. Bachman, 507 Fifth Avenue, (42nd Street.)

BOSTON Business-personal mail address, \$1.00 month. Service, 315 Atlantic Ave., Boston, Mass.

CHICAGO! Business-personal mail address, representation, forwarding; \$1.00 month. Established 1919. General Business Service, 56 West Washington.

DELAWARE Charters: Complete incorporating and organizing service \$35. Submitted forms. Chas. G. Guyer, Inc., Wilmington, Delaware.

ALL International legal matters. Lic. Victores Prieto, Mexican Attorney at Law, P. O. Box 122 M. Juarez, Mexico.

RUBBER STAMPS AND OFFICE SUPPLIES

NAME, Address, 2 lines 25c; 3 lines 35c. Stamp Works, Auburn, Nebr.

OFFICE Supplies—rubber stamps, Premiums. Catalog. Syleco, Downers Grove, Ill.

2 LINES 25c, 3 Lines 35c. Stamprite, FP43, Springfield, Mass.

CUSHION Mounted, one-two lines 25c, three 35c. Signatures \$1.50. Stamp Works, 811 Bradley, Peoria, Ill.

2 LINES 25c, 3 Lines 35c. Stamp Works, Centerport, N. Y.

TYPEWRITERS, DUPLICATORS, OFFICE DEVICES

NEW \$4.75 Automatic adding machine. Fully guaranteed. Bassett, Box 302A, Altadena, California.

3 TYPEWRITER Ribbons \$1.00. Lewis, 413 W. State, Milwaukee, Wis.

TYPEWRITERS, Duplicators, multigraphs. Write for free list office machine bargains. Save half. Pruitt, 518 Pruitt Bldg., Chicago.

INCREASE Business. "Excellograph" rotary stencil, clay and film duplicators \$3.85 to \$37.50. Prints anything. Typewritten, penned, drawn, traced. Colors. Folder free. Pittsburgh Typewriter Supply, Suite 518, Pittsburgh, Pa.

PRINTING, MULTIGRAPHING, MIMEOGRAPHING, GUMMED LABELS

BETTER Printing. Lowest prices. Specials on labels and tags. 2000 cards \$2.50. Card case, 1000 envelopes \$1.95. 1000 statements, letterheads \$2.50. Fein Bros., 116 Clymer Street, Brooklyn, N. Y.

PICTURE Your product on penny postcards in color. New process prints 5 colors in 1 impression. No cuts needed. Very low cost. Samples free. Burgess, 173 W. Madison, Chicago.

PRINTED Blotters, fine advertising medium. 500, \$1.50 up. Free proof service. Cherokee, Southern Pines, N. C.

\$1.85—1000 LETTERHEADS, Envelopes, circulars. Samples. Midwest Printing, Northfield, Minn.

2000 BUSINESS Cards, \$2.00 postpaid. HeyL, 800 Livingston, Cincinnati, Ohio.

294 LETTERHEADS, 5½x8½; 150 Envelopes; three lines; dollar, 10¢ extra west Mississippi. Perry Printer, Lafayette, Ind.

500 ¾x2¼ FOUR Line gummed stickers, 25c. Moritz Printery, Saginaw, Mich.

1000 EMBOSSED Letterheads, envelopes, statements, \$3.95. Charles Harmon, Chester, W. Va.

WEDDING Invitations. Samples, prices. Drachprint, 1619 Hogan St., St. Louis, Mo.

1000 ARTISTIC Gummed stickers, 4 lines, 50c. Cott's, Spickard, Mo.

1000 CARDS \$1.50; 1000 Statements \$2.50. Olsen, 1551 Southeast Powell, Portland, Oregon.

ENVELOPE Slips, 3x6, \$1.50 thousand. Thomas Gwynn, Printer, Adrian, Michigan.

250 LETTERHEADS, Envelopes, statements, or cards—\$1.00. Globe, Pottstown, Penna.

CHROMO—Mimeo—Multigraphing properly processed, illustrated, displayed, attracts attention; brings results. Summers Letter Shop, Jasper, Florida.

STATIONERY. Foreign, American types. Inexpensive. Samples. Croydon, 100 Fourth Avenue, New York.

ENVELOPES, 1000, 6¾, \$2.25. Samples. Specialty Sales, 3065 - 5th, Chicago.

1000 BUSINESS Cards \$1.25 prepaid. Hall, 1505 E. 52nd St., Los Angeles.

ENVELOPES! Thousand 6¾ postpaid, \$1.85, 2,000—\$2.95. Samples free! Nu-Print Co., Binghamton, N. Y.

BETTER Grade printing, reasonable priced. Free samples. Economic Press, Leonia, N. J.

FREE Samples name on envelopes, paper. The Democrat, Somerset, Penna.

125 BUSINESS Envelopes, 200 noteshheets \$1.00. Becker Bros., Portchester, N. Y.

500 TWO-COLOR Howard bond letterheads \$3.75; 500 6x9 bills \$2.50; 500 6¾ envelopes \$2.50. Press, Jamestown, Ind.

1000 BETTER Grade business cards \$1.50 postpaid. Harris Printing Co., Lawrenceburg, Tennessee.

\$1.00 SPECIAL—1000 3x6 Circulars, 100 word limit. Postpaid. Hustler, Advance, Indiana.

SEND Dollar bill, 1000 business cards prepaid. Woodprint, Woodstock, Virginia.

PRINTING! 1000 Business cards \$1.00. Cycle Press, Lawndale, Calif.

GUMMED Shipping labels 5,000, \$6. Patterson, 305E Southern, Springfield, Ohio.

ECONOMY. Quality—Distinctive printing. Get our prices, samples. DPress, Box 103, Station W, Brooklyn, N. Y.

KEEP With prosperity with Hall's distinctive stationery! Samples! Hall's Printing, Dalton, Massachusetts.

LABELS. Amazing values. Color samples free. 6618K Quimby, Cleveland, Ohio.

TRIAL 200 Hammermill letterheads \$1.00 postpaid. Race Printery, Hudson, N. Y.

1,000 3½x5½ PRINTED Adcards \$1.89; 5,000, \$7.95. Samples. Comstock, Charlestown, New Hampshire.

RAISED Letter printing. 100 letterheads—100 envelopes—\$1. Perry Press, Albion, Maine.

500 WHITE Envelopes \$1.00. Morey Press, 87 Somerset St., Springfield, Mass.

6x9 CIRCULARS. Letterheads, envelopes, postcards, \$2.95 1000; envelope slips, \$1.75. Half price large quantities. Samples. Goodprint, Harrisonburg, Va.

LETTERHEADS—1000, \$2.00, Hammermill bond \$3.00. Jennings-Pohle Press, Dent, B. Honesdale, Penna.

LETTERHEADS—Heavy bond 8½x11, envelopes, 100 each \$1.00. Evans, 44PM North Tenth, Reading, Pa.

500 ENVELOPES And 500 whitebond letterheads, \$3.00. Webpress, Farmland, Ind.

2000 BUSINESS Cards neatly printed \$1.50. Quick service. Free samples. Atlas Distributing Co., 1814 Bedford Ave., Pittsburgh, Pa.

LABELS—All kinds. Write, samples. JBSCo, Box 93, Holyoke, Mass.

500 LETTERHEADS, Envelopes, statements \$1.10; 1,000, \$2.00. Samples. Raymond's, Newport, New York.

PRINT Your own. Bargains. presses, type. List 3c. Exchange D-14, 22 Orient, Meriden, Conn.

1000 BUSINESS Cards, card case, \$1.50. Miller, Printer, Ambler, Pa.

CUTS 2x3, \$1.10, from drawings and photos. Joe Rek, 118 Gazette Ave., Lexington, Ky.

PRINTING OUTFITS AND SUPPLIES

FOR Sale—Most complete line of type and supplies in the West, new and used. Many bargains now. Get free catalogue and lists. Mocentral Type Fdry., Wichita, Kan.

NEW Type 20c font. Catalog dime. National Type Co., Jackson, Michigan.

HAND Press, type and complete printers' supplies. Advise equipment you need and we quote prices; or send stamp for catalog. P. Peiffer, 8 B; 6 Columbia St., Newark, N. J.

LONG Established amateur printers warehouse. Lists 3c. Landis, Richland, Pa.

PAPER—Wholesale prices 3c. Samples 10c. VanDorn Paperstocks, Ottawa, Illinois.

PRINT Your own cards, stationery, circulars, advertising, etc. Save money. Easy rules furnished. Print for others, big profits. Junior press, \$5.90; job presses, \$11, power \$149. Write for details. Kelsey Co., A-11, Meriden, Conn.

BARGAINS—Presses, type, supplies. Send stamp. 159 Harvard, Cambridge, Mass.

PRINTING Outfits—Presses, type, supplies, type novelties. Send 20c for card case samples. Catalog free. Model Press, York, Pa.

BARGAINS. Presses, type. List 3c. Exchange D-15, 22 Orient, Meriden, Conn.

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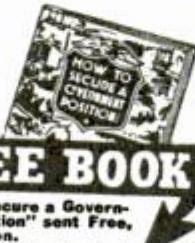
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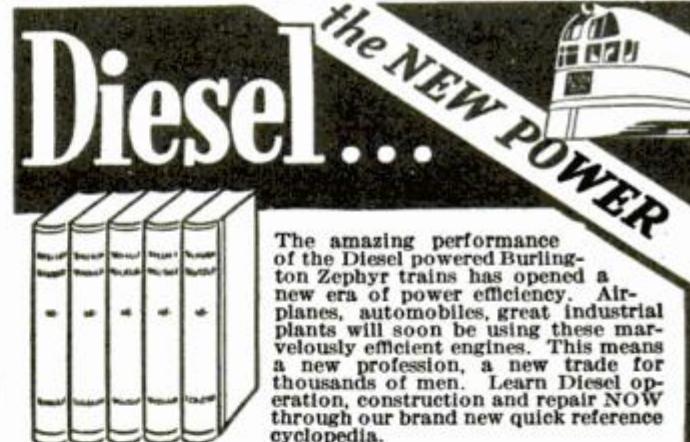
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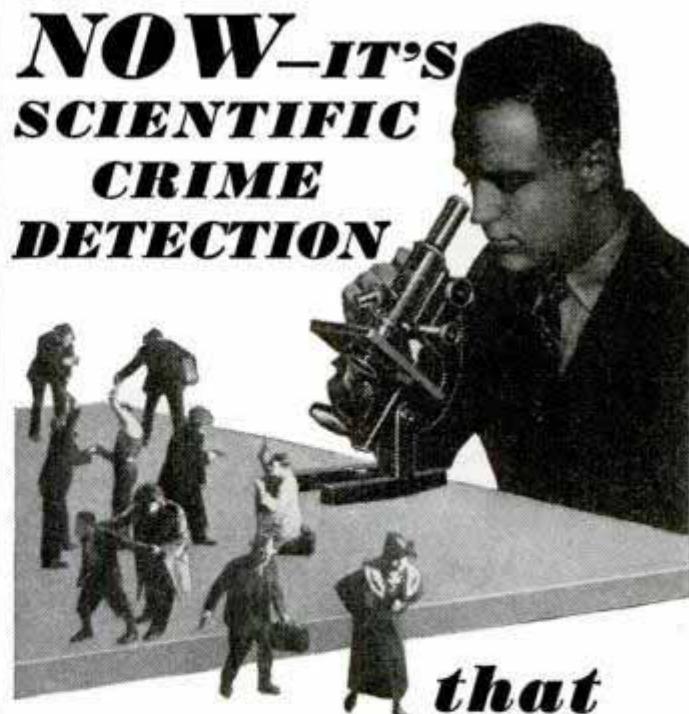
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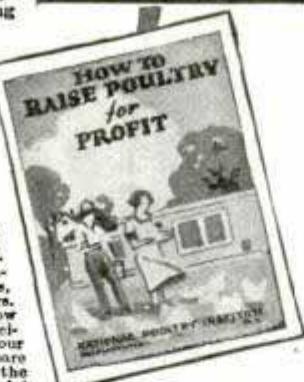
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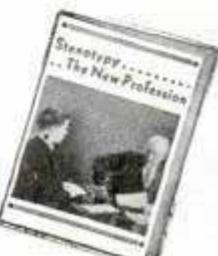
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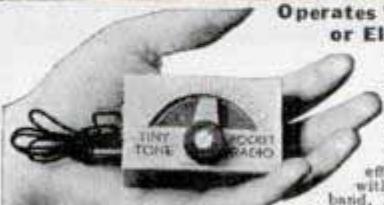
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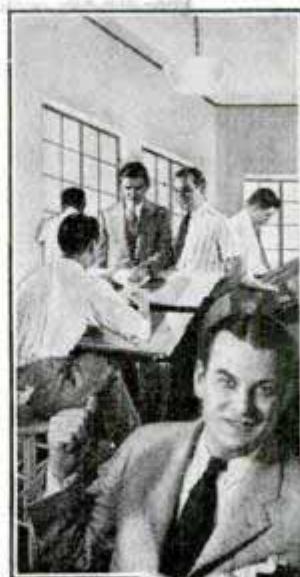


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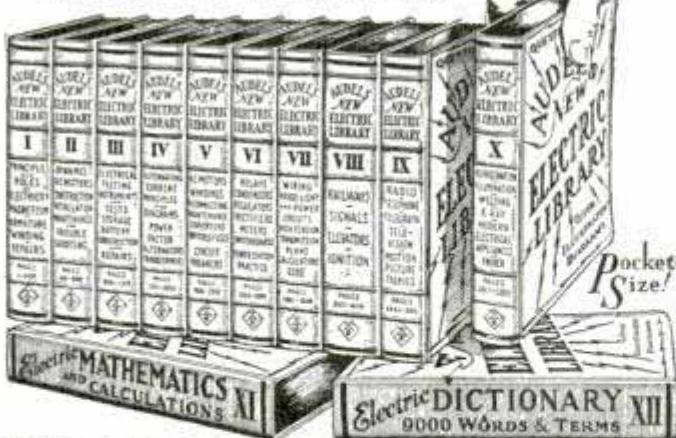
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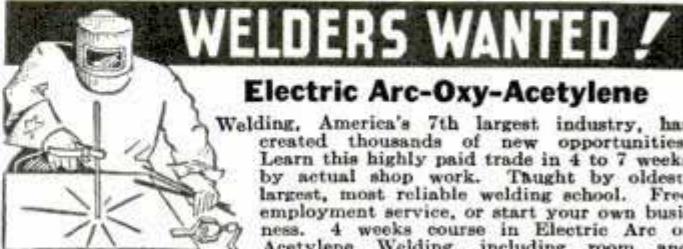
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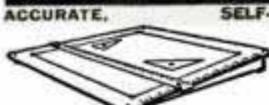
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STAMPS and COLLECTING

(Continued from page 49A)

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est son of King Leopold III. A pictorial set issued by Cuba marks the celebration in connection with the unveiling of a monument to General Maximo Gomez. There are five postage stamps, one special delivery and two airmails. France has issued four values for the Unemployed Intellectuals Relief Fund. Another French stamp for the same purpose has been made by reissuing a 1935 stamp and surcharging it with a new value. Greece has a stamp to commemorate the burial in Athens of King Constantine and Queen Sophia. The 1936 New Zealand Health stamp shows a girl's head within a life preserver. Four new values for the Italian occupation of Abyssinia show a portrait of King Victor Emmanuel III. A series of five has been issued by Danzig for Winter Aid.

An All British Album

The recent publicity which the ruling family of Great Britain has received will be reflected by greatly increased sales of coronation issues next May. Many collectors will buy the complete series and mount it in a special album. An interesting introduction may be formed by mounting at the front a selection of stamps showing the previous rulers of Great Britain, and the members of their families. It will be a simple matter to find stamps showing the rulers from Queen Victoria to the present time but only a few of the earlier kings have been pictured on stamps.

Henry VII, who ruled from 1485 to 1509, starts the list, and is found upon the sixty-cent value of the Cabot issue of Newfoundland. Elizabeth, next in order, also will be found upon a Newfoundland stamp, the twenty-four-cent value of the Gilbert issue of 1933. Her successor, James I, shows in the Guy issue of 1910 of the same colony. His son, Charles I, is pictured upon a Barbados stamp of 1927. A long gap follows until the portrait of William IV appears on the 1934 Centenary issue of St. Helena. His niece Victoria, who succeeded him, is found upon great numbers of stamps in a variety of portraits beginning with her coronation and extending on to her death in 1901. The 1897 Jubilee issue of Canada presents her as she appeared in 1837 at the left, and in 1897 at

the right. Her consort, Prince Albert, is shown upon a Canadian stamp of 1851-59. Her son, Edward, Prince of Wales, later Edward VII, appears upon Newfoundland stamps from 1868 to about 1890. Edward VII, as monarch, will be found upon practically all empire stamps issued during his reign. Queen Alexandra is found upon the stamps of Newfoundland in 1898.

The second son of Edward VII, who later succeeded to the throne as George V, appears in the 1898 Newfoundland issue, as does his infant son David, later Edward VIII. His portrait and that of the queen are on stamps issued in 1928 by Newfoundland and in 1935 by Canada. In the few months during which Edward VIII ruled, a beautiful series of four stamps was issued bearing his portrait. These were for use in Great Britain. Newfoundland shows the Duchess of York, the present queen, in 1932 on a seven-cent stamp, and had shown her daughter Elizabeth, now Princess Royal, in the previous year. Canada also gave collectors portraits of Princess Elizabeth and her father in her Jubilee set of 1935.

The Lesser Gold Coins

The coinage of quarter eagles, or \$2.50 gold pieces, commenced at the Philadelphia mint in 1796, and was continued until 1929 except for a few years. Other mints, except Carson City, also have produced them at various times.

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Coins of 1796 with sixteen stars on obverse and fifteen stars on reverse sell for about \$150 and those of 1806, showing that date impressed over 1805, have brought \$300. The coin of 1863 is very scarce as only thirty pieces were minted, with 1875 as a second choice with 420 pieces minted. A commemorative quarter eagle was minted in 1915 in connection with the Panama Pacific exposition. This also is considered rather rare.

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PHOOEY ON THIS WEATHER. I'D GIVE UP ANYTHING, EVEN MY PIPE, IF I COULD BE WARM AND CLOTHES-FREE LIKE THOSE SAVAGES COLUMBUS DISCOVERED

SURE - BUT WHY GIVE UP YOUR PIPE?

BECAUSE MY PIPE IS THAT'S WHERE IMPORTANT TO ME - YOU'RE WRONG. AND THOSE WEST INDIAN NATIVES DIDN'T KNOW THEY WERE SMOKING ANYTHING ABOUT WHEN COLUMBUS DISCOVERED THEM

THAT OCTOBER MORN IN 1492, COLUMBUS WAS DUE FOR SOME SURPRISES -



ONE OF THE MOST CHERISHED OFFERINGS OF THE NATIVES WAS LEAF-TOBACCO, WELL DRIED AND READY FOR SMOKING



MOST OF THE NATIVES SMOKED BY MERELY INHALING THE FUMES, BUT SOME OF THEM HAD A LONG, HOLLOW TUBE WITH THE FORKED ENDS INSERTED IN THE NOSTRILS



WELL, COLUMBUS MAY HAVE DIS-COVERED THIS INDIAN CUSTOM BUT PRINCE ALBERT BRINGS IT TO PER-FECTI



YOU BET! IN ALL THE YEARS I'VE BEEN SMOKING P.A. IT HAS YET TO

BITE MY TONGUE OR BURN TOO HOT FOR COOL ENJOY-MENT



DON'T MISS THIS FAIR AND SQUARE OFFER!

PRINCE ALBERT MONEY-BACK GUARANTEE
SMOKE 20 FRAGRANT PIPEFULS OF PRINCE ALBERT. IF YOU DON'T FIND IT THE MELLOWEST, TASTIEST PIPE TOBACCO YOU EVER SMOKED, RETURN THE POCKET TIN WITH THE REST OF THE TOBACCO IN IT TO US AT ANY TIME WITHIN A MONTH FROM THIS DATE, AND WE WILL REFUND FULL PURCHASE PRICE, PLUS POSTAGE.

(Signed) R. J. Reynolds Tob. Co., Winston-Salem, N.C.

PRINCE ALBERT THE NATIONAL JOY SMOKE!



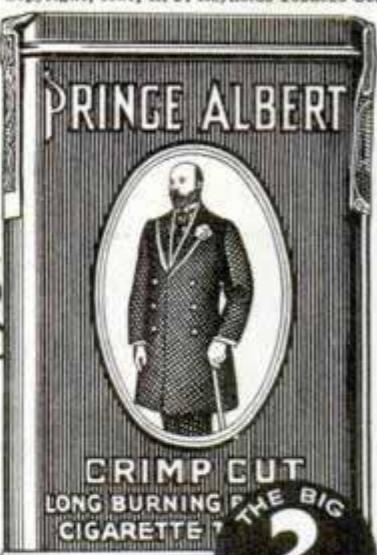
PRINCE ALBERT IS MILD... THE BITE IS REMOVED



TRUST 'CRIMP CUT' P.A. TO GIVE COOLER SMOKING



I ROLL 'EM QUICKER AND EASIER USING PRINCE ALBERT



50 pipefuls of fragrant tobacco in every 2-oz. tin of Prince Albert

Popular Mechanics Magazine

REGISTERED IN U. S. PATENT OFFICE AND CANADA

WRITTEN SO YOU CAN UNDERSTAND IT

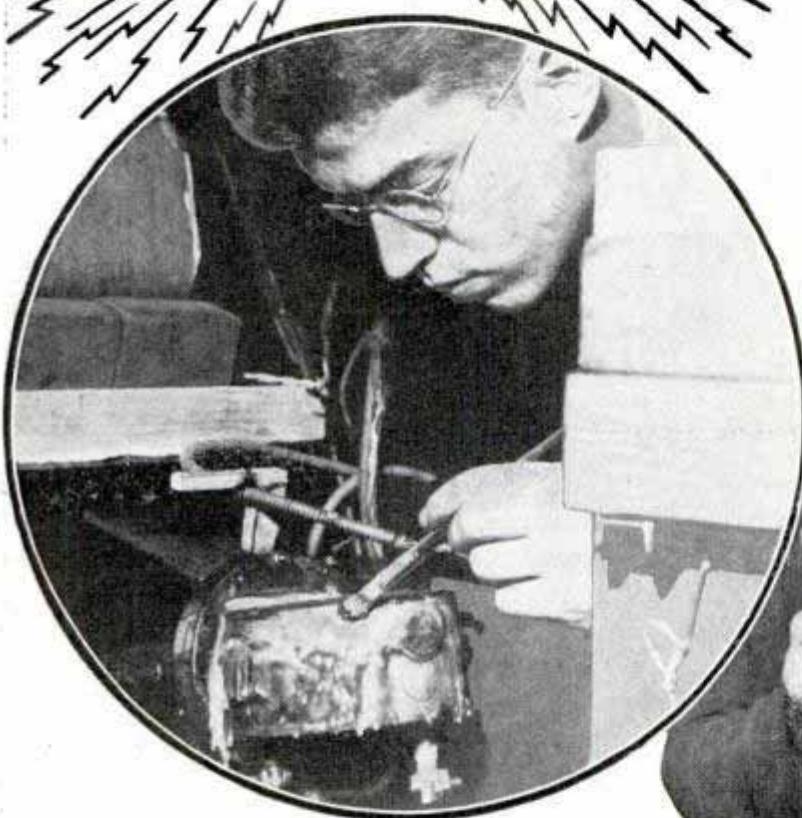
Vol. 67

MARCH, 1937

No. 3

SMASHING-ATOMS

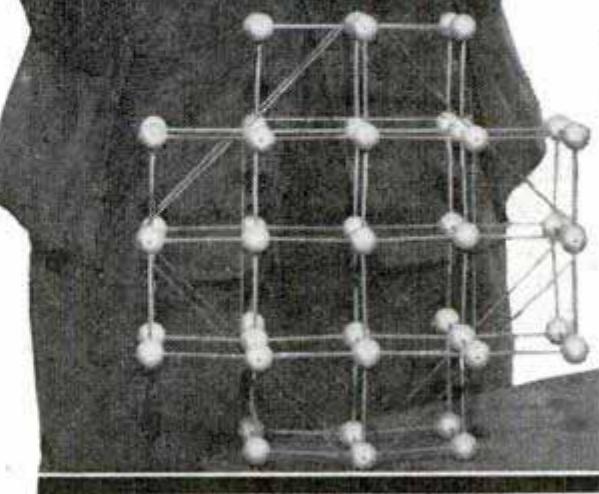
F1660



WHAT is an isotope? Does radio sodium mean anything to you? Have you ever heard of protium or tritium?

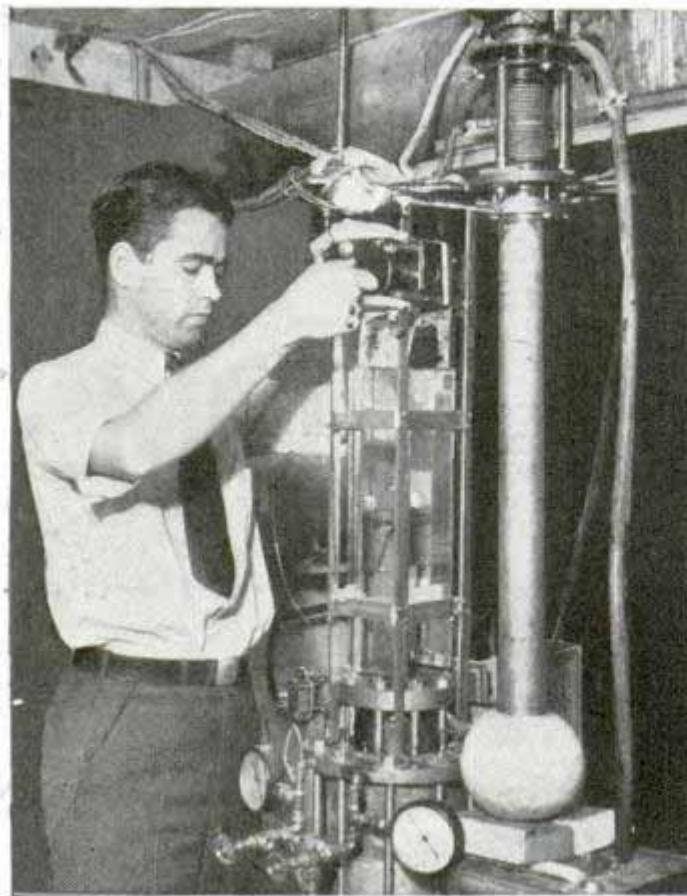
Possibly not, since these are brand new words. But you are apt to hear more about them in the future because they are symbols of a new kind of chemistry for which great things have been predicted.

The basis of this science was the discovery that instead of the ninety-two elements we believed composed all matter, there are really several hundred kinds of basic matter. No one knows how many because new ones are being uncovered all the time. Late last year the number of stable elements stood at 250 and in addition a large number of unstable elements had been listed.



Model held by man shows crystal structure of potassium and one on table shows structure of tin. In circle, sealing chamber of mass spectrometer with wax

Reference - Mr. Wm. V. Houston 321



Left, adjusting automatic camera which records transmutation of elements by making pictures of tracks of atoms. Right, part of fifteen-foot vacuum tube used to "shoot" atoms

It isn't quite proper to say these are entirely new elements. In a strict sense, they are merely varieties of the original ninety-two. Scientists call them isotopes. The isotopes of an element are all chemically the same. The difference is in their weight. One kind of hydrogen atom weighs more than another kind even if there is no chemical way to tell them apart. The important thing is that heavy hydrogen can do a lot of tricks that ordinary hydrogen can't. One trick is the creation of the strange liquid called heavy water.

These new chemical tools are expected to enable scientists to go after physiological and biological problems better. By earmarking isotopes of some substance and watching their effect on the body, a better understanding of the body and its chemical processes is anticipated, increasing the ability of the medical world to relieve pain and prevent disease. One way in which this study is being pursued is with heavy water. Until recently there was no exact way of learning how long it took water to be absorbed by the tissues or put to use in other ways in the body. By feeding a "tagged" sample of heavy water to a patient physiologists can trace

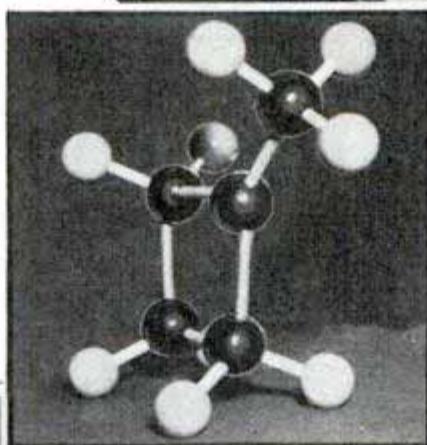
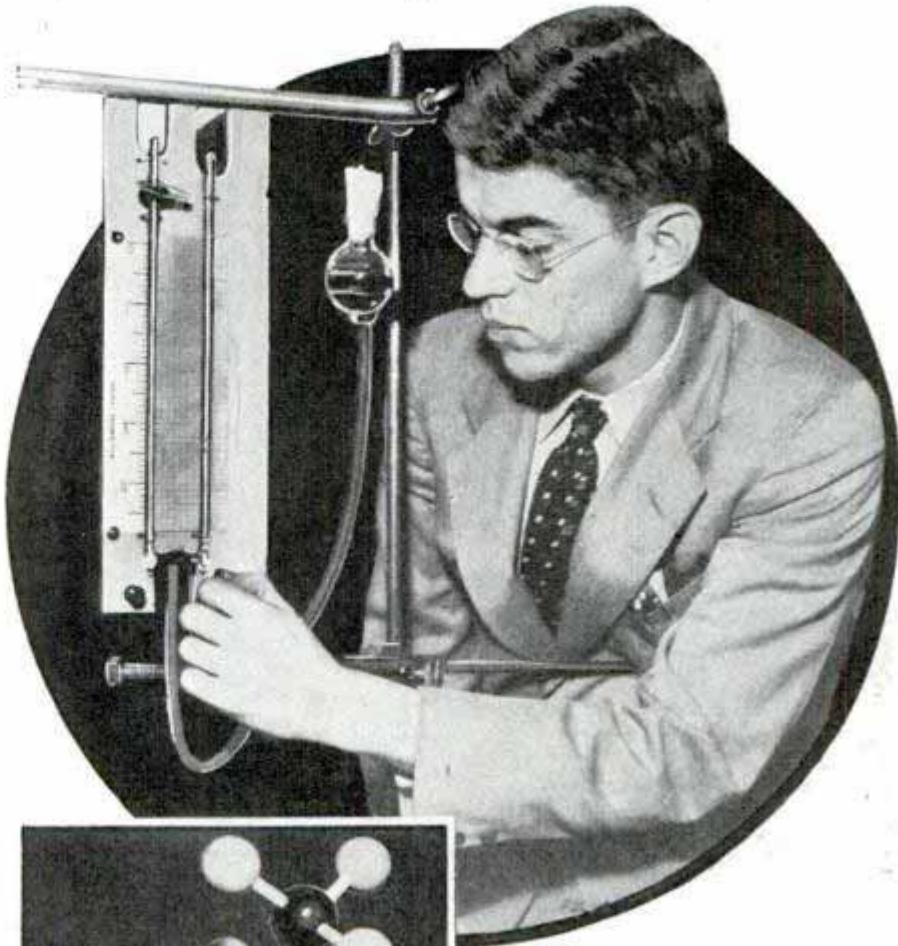
its course through the body almost minute by minute.

These new building blocks also are leading to a more complete knowledge of chemical reactions. What chemical transfers of atoms occur when sugar, for instance, is dissolved in water? The answer is supplied by heavy hydrogen. The trick is to start with a compound containing heavy hydrogen instead of ordinary hydrogen, and after the mixture has been made, to examine the other substance and learn whether heavy hydrogen has changed places with some of the ordinary hydrogen atoms in its own structure.

No one knows how important isotopes are going to be in the future. It may take a generation to survey the possibilities. It has been suggested the new isotopes may lead to making poisonous substances non-poisonous and vice versa, giving transparent materials an opaque quality, and giving a flexible condition to some stiff substances. The investigation of isotopes started after it was learned the atomic weight of an element merely represents the average weight of its atoms. It had been supposed previously that all atoms of any element weigh exactly the same.

Scientists now know there are three kinds of hydrogen atoms and each has a different weight. There are three isotopes of oxygen, also, and two weights of helium. Molybdenum has seven isotopes. Almost all the elements have a number of different varieties. In the isotopists' dictionary ordinary hydrogen is called protium. Heavy hydrogen is deuterium, while mass three hydrogen is tritium. Heavy water, in which heavy hydrogen takes the place of ordinary hydrogen, may be called deuterium oxide.

Although heavy water is chemically the same as ordinary water it weighs about ten per cent more. Microorganisms, small fish, and some plant seeds die in it. Some chemical reactions speed up while others are slowed down under its influence. Heavy hydrogen may be one of the most important of the



Top, electrolysis gauge which records collection of isotopes. Center, model showing atom arrangement in molecule of rare poison gas. Bottom, apparatus for collecting heavy hydrogen atoms

new building blocks. The difference between it and ordinary hydrogen is much greater than between the isotopes of most of the other elements. Its importance rests on the fact that hydrogen is an almost universal element. Ninety per cent of the some 350,000 different chemical compounds known today contain hydrogen or water or both. It may be that substituting double-weight hydrogen in its ordinary proportions in some of these compounds will lead to strange results.

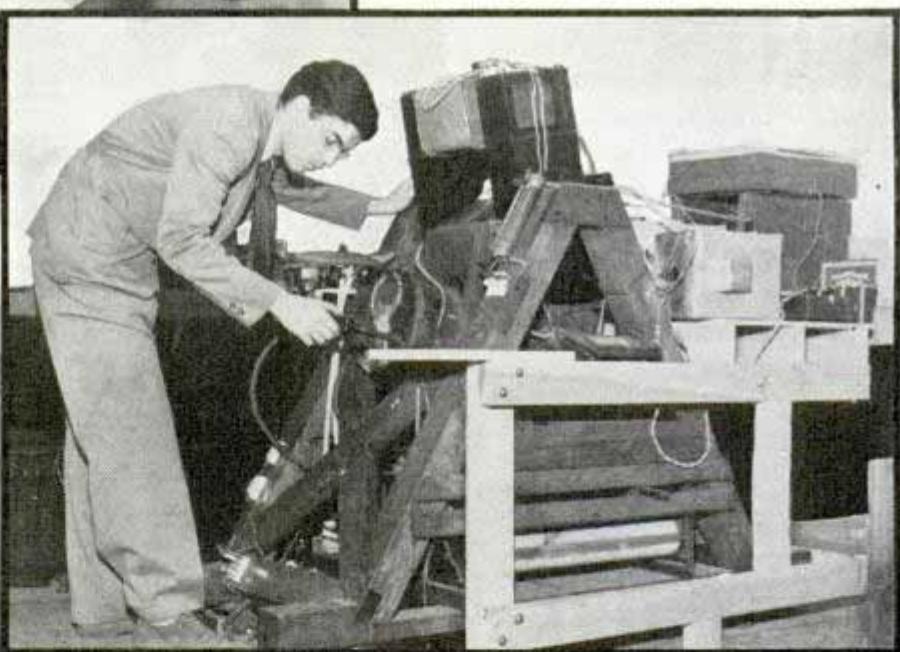
Heavy hydrogen is extremely rare and occurs in the ratio of one to 5,000 with ordinary weight hydrogen atoms. But you might find quite a bit of it in your automobile battery, especially if the



battery is old. The best method of recovering heavy water is by electrolytic action, the process involved in storage batteries. Ordinary water evaporates with the battery fumes but the heavy hydrogen stays behind. In commercial practice about fifty tons of ordinary water are treated to yield one pound of pure heavy water. The market price is about \$2 per gram.

Tritium, the triple-weight isotope, is the rarest of all hydrogen atoms. It occurs in the ratio of one to 200,000 ordinary hydrogen atoms and would cost something like \$1,000,000 per gram to collect. In combination with oxygen it would create water more expensive than radium. Today it is possible to create twenty-seven different kinds of water all having different densities by using different isotopes of hydrogen and oxygen.

Most people think of elements as stable



Top, model showing complicated crystal structure of an element. Below, mass spectrometer which segregates isotopes by weight

substances. Scientists know that with the passage of enough time everything changes. The elements they consider to be stable are described as having "a half life one million years." Eighty-one major elements fall into this group while the remaining eleven, including radium and other highly radioactive elements, are classed as unstable. It is estimated that radium is changing form so rapidly that only half as much exists today as was present 2,000 years ago.

Potassium, sodium, and a number of the other stable elements are radioactive to a slight degree. In most cases this radioactivity seems confined to one isotope of an element. But physicists are able to segregate these isotopes, in effect creating a new class of

elements that might be described as "radio sodium," "radio potassium," and so on. All of these substances are highly unstable. They may change into inert forms within a few seconds or within a few days.

One suggestion is that radio sodium may become the preferred treatment for cancer when it can be manufactured in sufficient quantities. Radio sodium in salt form could be injected directly into a patient so its emanations could attack the cancer at close quarters. Since this isotope is very

unstable its radioactivity would vanish in a few hours, long before it damaged the rest of the body.

As now understood, the difference between isotopes of an element lies in the make-up of the nuclei of the atoms.

"Scientists visualize an atom as consisting of a nucleus surrounded by one or more moving electrons," explains a physicist of the California Institute of Technology. "The electrons are minute quantities of negative electricity. The nucleus consists of a number of protons carrying positive charges and a group of neutrons, particles electrically neutral. The negative charge of all of the electrons is supposed to balance the positive charge of the nucleus.

"The only difference between one element and another lies in the number of protons in the nucleus. That is the same as saying that if one could add or subtract protons, one could change one element into another. For instance, you could turn lead into gold, or oxygen into radium. To a limited extent this is being accomplished.

"In the same way, the only difference between isotopes of an element is in the number of neutrons contained in the nuclei of its atoms. If you add or subtract neutrons without disturbing the protons you are able to create lighter or heavier varieties of the same element. All parts of the atom bear a mathematical relationship to each other something like the mathematics of chemistry."

So far, the most practical way of obtaining samples of isotopes has been to gather them up instead of manufacturing them. One method is to use a diffusion apparatus that filters them out of gases. A gas such as hydrogen is made to pass through the pores of a thin clay pipe. The light atoms of hydrogen pass through easily while the heavier atoms are left behind. This diffusion is repeated until all the heavy hydrogen atoms have been collected in one place. Many elements aside from true gases can be given a gaseous state and put through the apparatus.

Another way by which isotopes can be

(Continued to page 158A)

F/1546 Turtles Kept in Warm Tank Awaiting Lord Mayor's Soup



© Planet News, Ltd.

Selecting turtles to make soup for the Lord Mayor's banquet at London. They are kept in this electrically heated tank

Until time for the traditional Lord Mayor's banquet in London twenty turtles are kept comfortable in a tank electrically heated. Then their turn comes to provide the famous turtle soup which has been a delectable part of the menu for hundreds of years. For the last thirty years one man has performed the annual duty of selecting the turtles for this dinner.

F/662

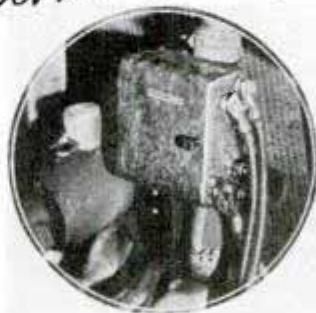
Automatic Unit Keeps Engine Warmed Up in Winter

Designed to keep the automobile engine warmed up in cold weather without at-

About 76.00

tention, an automatic unit starts the motor when the temperature drops and stops it when the water temperature rises to a predetermined point. It operates when the car is in the garage or

parked with ignition and doors locked, but will not start the engine if the car is in gear. An added advantage is that the battery is charged as the motor runs, assuring a full charge throughout the winter.



The Sunneheat Co.

F1684 Skiers "Hitchhike" to Hilltop on Cable Line

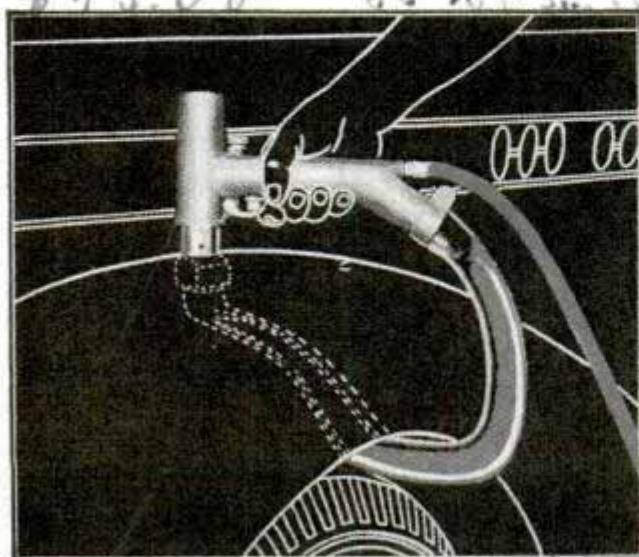


clerk
This is one way to make skis more popular. Skimming down a mountainside takes skill but little effort; climbing up takes plenty of effort, so a cable was installed at Hanover, N. H., to haul skiers to the top

Skiing is more fun and less work at Hanover, N. H., since a trolley line to the hilltop was installed to haul the winter sportsmen up. After a fast slide, Dart-

mouth college skiers grasp poles attached to a traveling cable and are dragged to the top. The cable moves up and down the mountain supported by a series of posts.

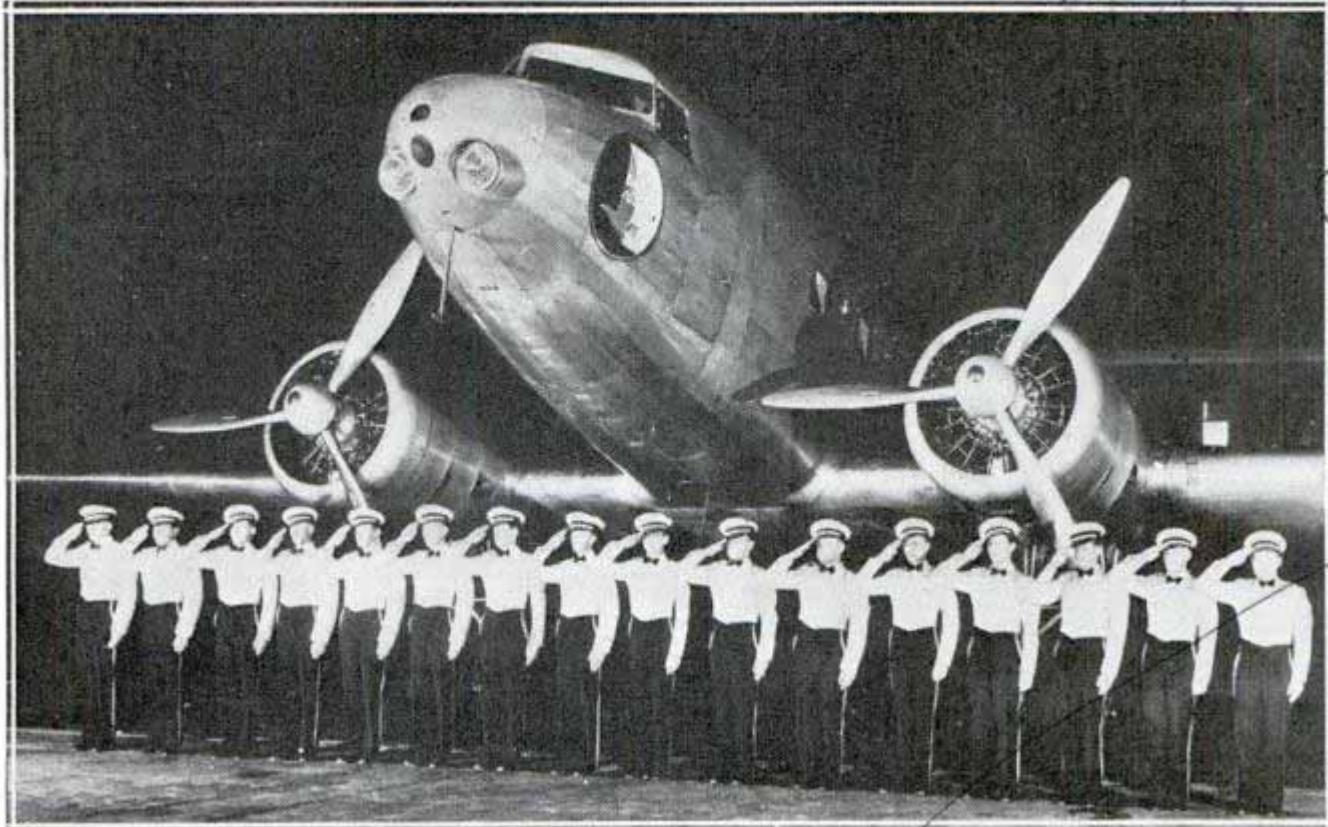
F1703 Air Hammer for Auto Strikes 4,000 Blows per Minute



Four thousand blows per minute are delivered by a pneumatic hammer designed for straightening automobile bodies and fenders. The hammer weighs only fourteen pounds and can be manipulated with one hand. Economical in operation, it uses a small volume of air and requires seventy-five pounds or more air pressure. The hammer head moves in a floating piston or guide, and starts pounding instantly when a trigger is pressed. An air valve controls speed and power of strokes. Special arms permit work on deep-skirted fenders without removing the wheel, and four dies to fit all flat or curved surfaces are supplied with the hammer.

see April 1935
Weaver Mfg. Co. Springfield, Mass.

“Flying Bellhops” Serve Air-Line Passengers



First of the companies of highly trained stewards ready to begin their duties aboard air diners of the type before which the smartly uniformed men stand

Service aboard air liners operating along the east coast of the United States will be dispensed by “flying bellhops,” the first squad of which has just completed its training and been placed on the planes.

Wearing trim uniforms, the bellhops are trained to serve meals with finesse, shine shoes, carry luggage and perform any other service conducive to the passenger’s enjoyment of the air journey.

Fireplace Gives Lounge Car Appearance of Living Room

Second
F16 96
Lounge cars built recently by the Frisco lines are given a cozy, home-like appearance by a fireplace at one end of the room. The decorating scheme is of modern character, with aluminum trim, Venetian blinds, bleached-wood furniture and walls of light aspen veneer applied over furniture steel with rubber cement. The fireplace is equipped with a set of andirons and its backlog is electrically wired to simulate the red glow and shimmering flames of a real log fire.

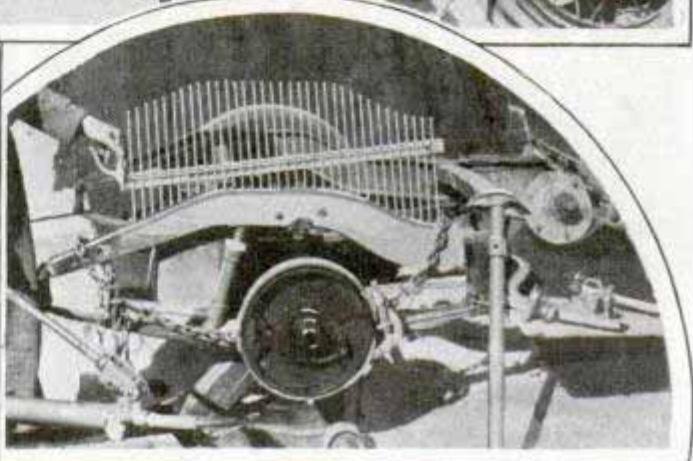
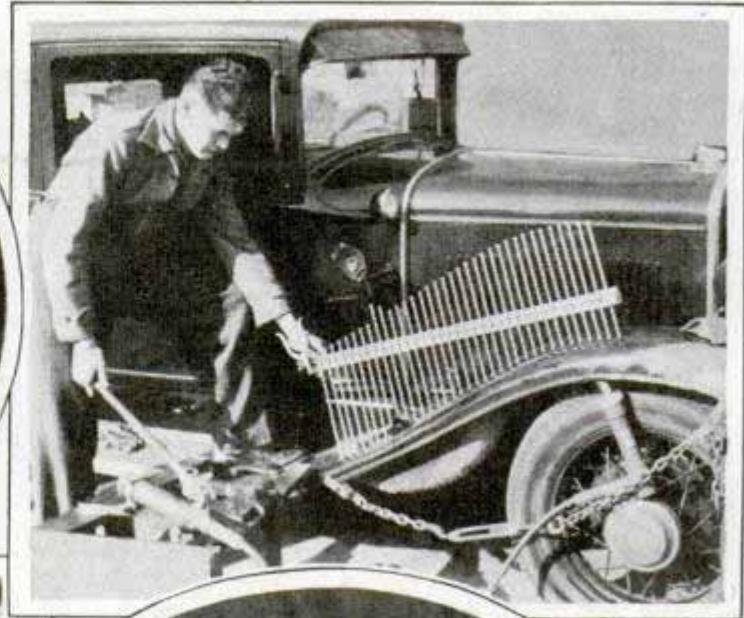
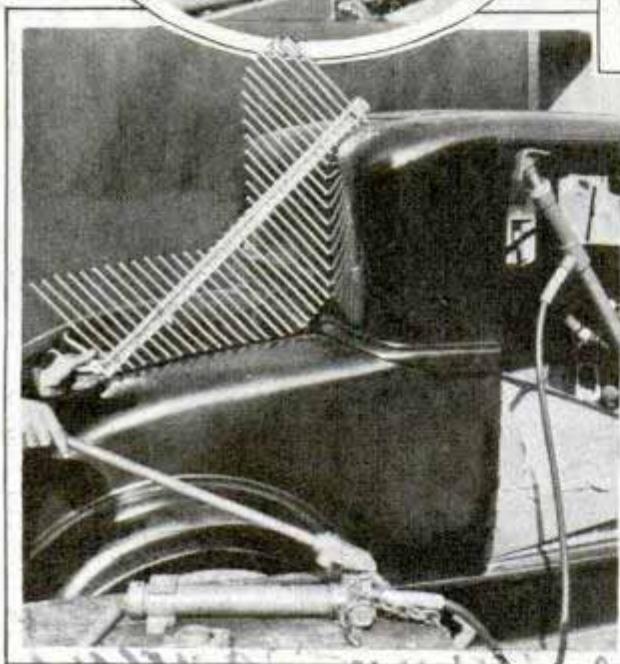


False fireplace with electrically lighted log makes lounge car cozier

3412 Herbert St. San Diego, Calif.

Contours Measured and 'Frozen' in Template

F1628.

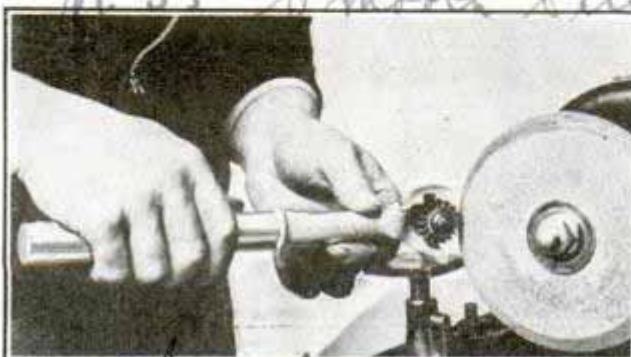


Taking the measure of curves and angles of various parts of an automobile. The "finger" rods of the template assume the contour of the body and then are locked in position at the touch of a handle

Automobile body contours can be measured accurately by a template which "freezes" at the touch of a handle, locking the contour curves until a latch is released. The template is a precision tool used in body and fender work, airplane

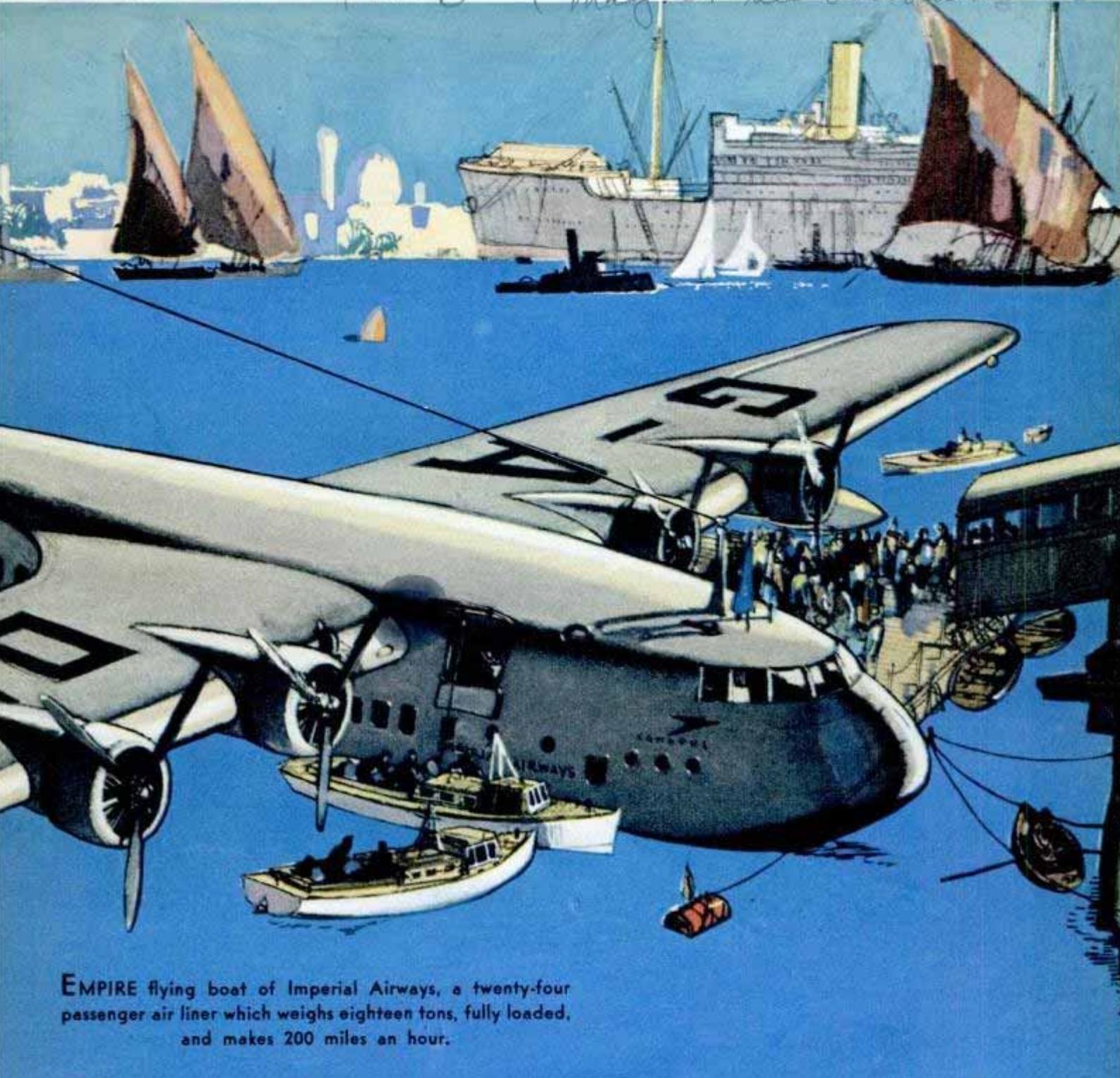
construction, architectural designing and sheet-metal work. When a quick measurement of a contour is desired it is simply held so that its fingers "feel" the body and automatically fall into position, to be locked firmly in that shape.

Emery Wheel Dressed Quickly with Fast-Cutting Tool



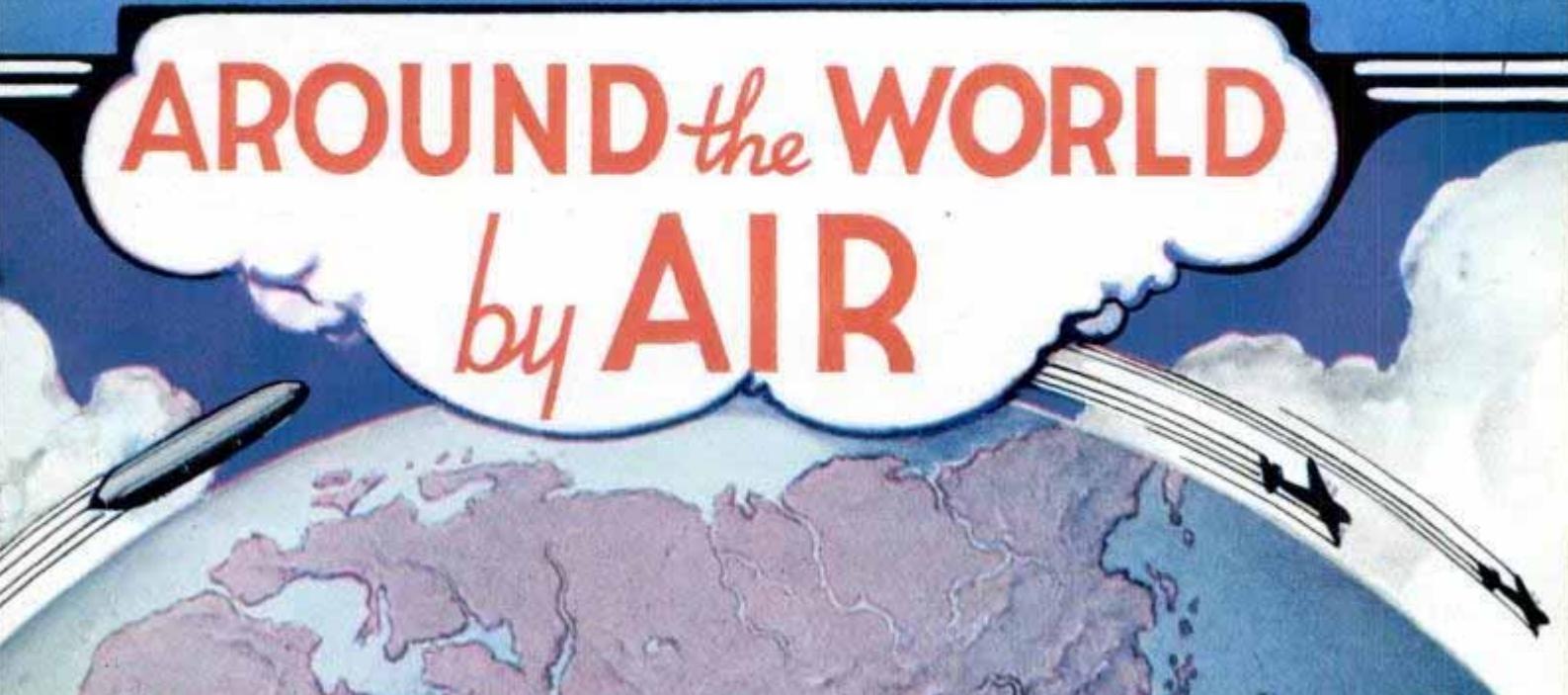
Accurate dressing of emery wheels can be accomplished quickly with a new smooth-side dressing tool. It has a shock-absorber bearing which makes possible the shaping of wheels to special grinding jobs and has an open side which permits dressing a wheel right up to the arbor collars. The tool prepares the right shape for grinding circular saws without altering the original shape of the teeth.

Thompson Mfg. Co. Meadville, Pa.



EMPIRE flying boat of Imperial Airways, a twenty-four passenger air liner which weighs eighteen tons, fully loaded, and makes 200 miles an hour.

AROUND *the* WORLD by AIR



T1267



MODEL of Empire type flying boat of Imperial Airways. It contains a promenade, kitchen, smoker, separate radio room and carries twenty-four passengers.

By H. W. MAGEE

PART II

ON the third lap of your trip around the world by air, you hop across the Pacific. Sounds simple, doesn't it? And, as a matter of fact, it is quite simple today as compared with five or six years ago.

In 1931 no seaplane had been built that could fly the 2,400-mile stretch from San Francisco to Hawaii with a safe fuel reserve, let alone a pay load. Nowadays the China Clippers of Pan American Airways are covering the 8,000 miles from San Francisco to Manila in five days—sixty hours of actual flying.

The air conquest of the Pacific stands as a brilliant chapter in aviation history—bold pioneering as thrilling as the building of the first transcontinental railroad. That railroad brought New York and San Francisco within less than a week's

travel. The Clippers have brought San Francisco within five or six days of the Orient, and New York, by air, is about as close to the Orient now in terms of travel as it used to be to San Francisco.

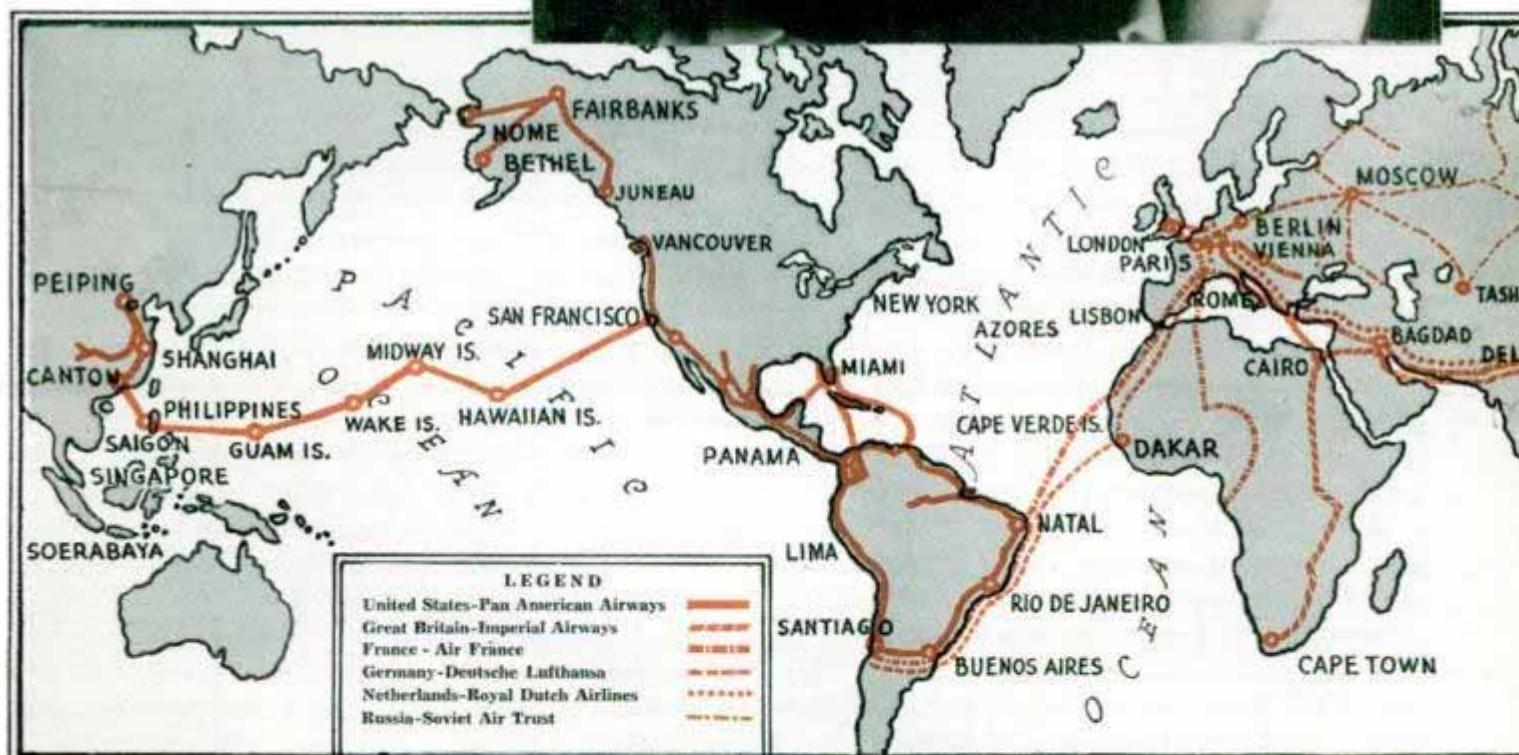
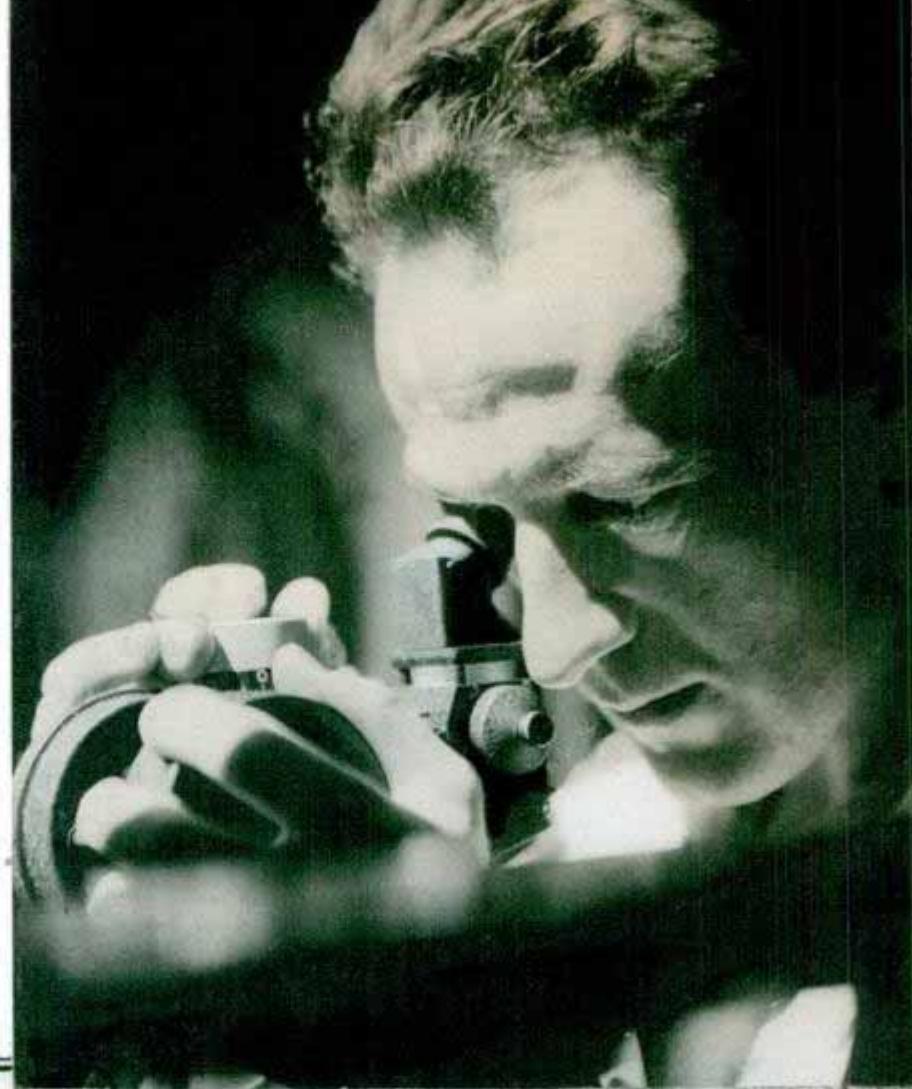
Pan American was operating 25,000 miles of aerial trade routes between the Americas when it began to cast a speculative eye on the Pacific. And at first glance, the thousands of miles of trackless ocean wastes seemed unconquerable. Who ever heard of flying on regular

schedules over an ocean extending over about one-third the circumference of the globe? But then, who ever heard of a transcontinental railway until one was built? Pan American decided to conquer the Pacific.

A survey revealed that fate or destiny had taken a hand in the matter by dotting the only logical route with four little islands—Hawaii, Midway, Wake and Guam. What could be more practical than to convert these specks of land, all possessions of the United States, into



OPERATING one of the many navigational aids carried on board the Clipper ships of Pan American Airways. During the night celestial navigation is carried on by the stars. Of course, the ship is kept on course by constant radio compass bearings as well. Below, commercial air line map of the world, showing how they connect.

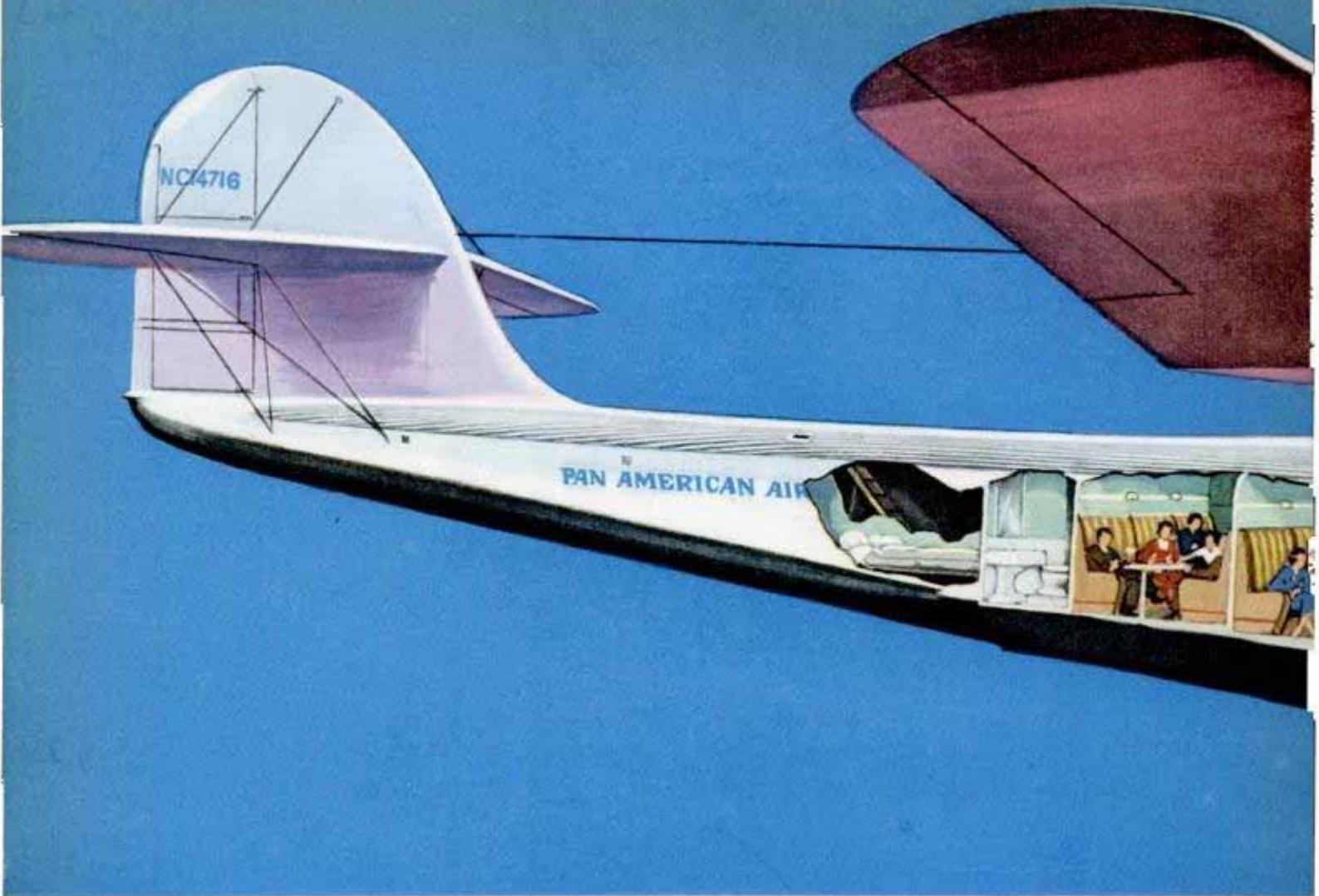


intermediate air bases? But even after the route had been broken up into laps by these islands, the task of flying the Pacific still challenged the imagination.

Better power plants were necessary. Some of the islands were nothing more than barren stretches of coral and sand. Precision methods of navigation were

necessary if seaplanes were to fly over thousands of miles of trackless ocean. No flying crews were trained for trans-oceanic service. No ground organization existed for servicing ocean airliners from the island bases.

Each of these problems was faced and solved before there were any wings over

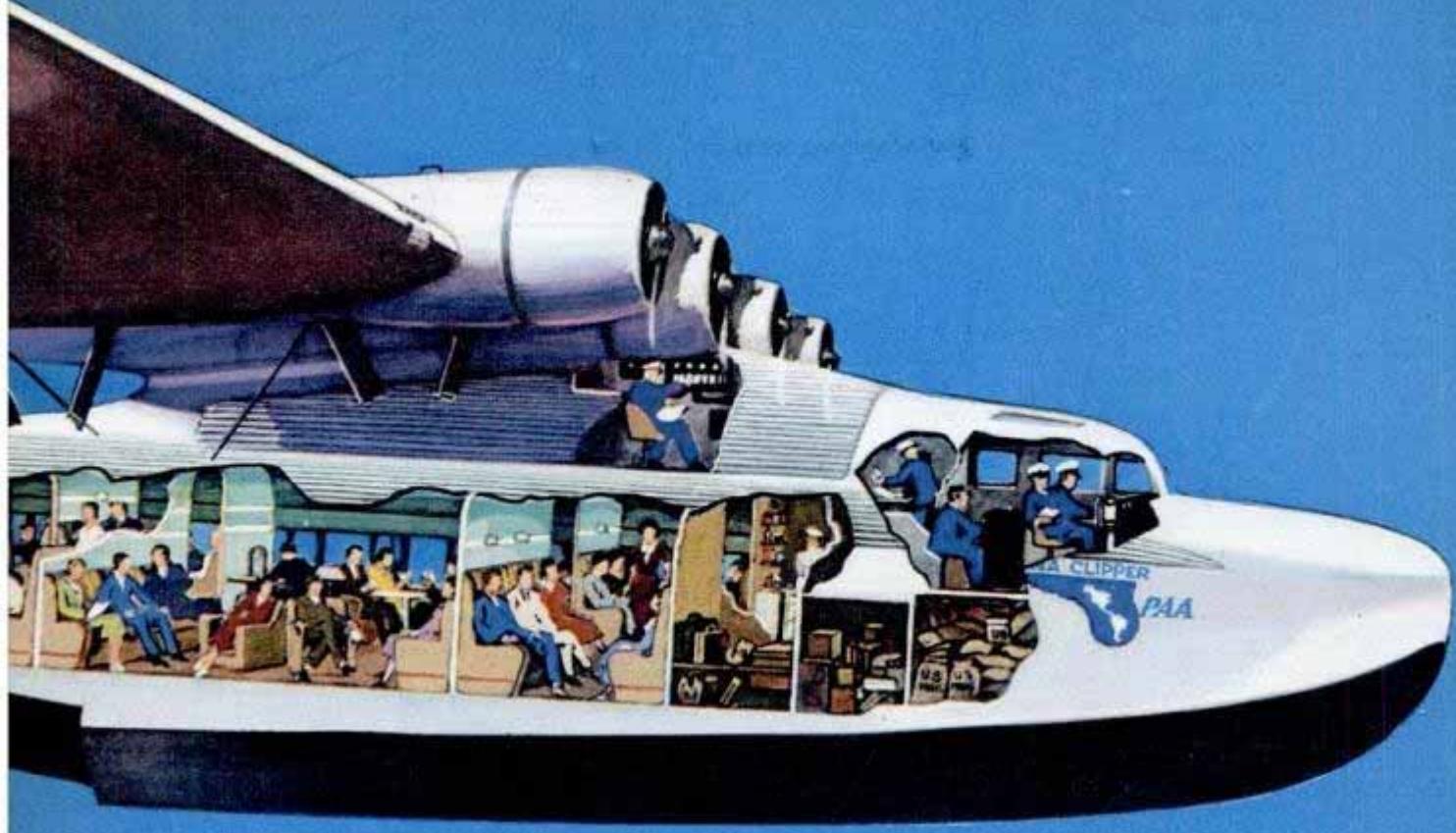


the Pacific. The design and construction of the Clipper ships was an epic in itself. Pan American wanted seaworthy flying boats able to cruise 3,000 miles, even against a head wind, at 150 miles an hour. Also they must carry a profitable pay load. Igor Sikorsky built a nineteen-ton flying boat to fulfill trans-oceanic conditions and Glenn Martin built a twenty-five and one-half ton ship. Both planes emerged from flight tests with flying colors. The Brazilian Clipper, Sikorsky's ship, was licensed to carry 99.8 per cent of its own dead weight, the China Clipper produced by Martin, 102.1 per cent. Each had a top speed of more than 180 miles an hour and a cruising speed of 157 miles.

Next in importance were the island bases. Thousands of tons of supplies were taken to the little dots of land. Ground crews were left there to build everything from hotels to weather stations and air beacons. Then there was the matter of developing lightweight, low-powered radio to cover the whole Pacific and extending the range of air-

craft radio direction-finding devices. Crews were trained so that each man could perform the duties of every other member as well as his own. Test flights were made to prove the plans and everything went off like clockwork. Soon Clipper ships were making regular trips over the ocean—the Pacific had been conquered.

And now the Clippers are carrying passengers in five days over a route which the old sailing clippers required two months or more to travel. On your journey over the Pacific, you hop off from Manila, headed for Guam, 1,600 miles distant. The trip gives you ample opportunity to become acquainted with a modern air Clipper. Its two roomy compartments and main salon are equipped with comfortable divan seats. You can stroll about at leisure or, through the large windows, watch the clouds paint shadows on the water below. You see an occasional steamer plodding through the waves, rising and falling on the skyline. Tired of looking, you play cards, read, write, eat or sleep.



CROSS section drawing of China Clipper which has wing spread of 130 feet, length of ninety feet and a cruising speed of 150 miles an hour.

T1263

Up front the four twin-row 800-horse-power Wasp engines purr smoothly and on the flying bridge those of the crew of five on duty at the moment, are concerned with radio direction finding, navigation and maintaining radio contact with distant stations and steamers. At last your flying boat skirts a massive cliff rim and glides into the harbor at Guam. Perhaps you motor around the island, go to a movie or wander through the quaint old Spanish town. You spend the night at an Airway Inn—a hotel brought piecemeal to the island and set up in sections.

The next lap is from Guam to Wake, one of the longest of your flight. You are off at the crack of dawn and there's another day of watching the water. You'll find Wake a tiny mid-Pacific atoll consisting of three narrow islands, each about one and one-half miles long. Laid end to end, they form a horseshoe, the open end of which is protected by a massive reef to form a lagoon on which your

Clipper lands. Here you find a little village—a dozen houses, a big beacon, an Airway Inn, a dock. You may fish or dive down into the magnifieent forest of coral, wearing water glasses so you can get a closeup view of the multi-colored tropical fish.

Another dawn and you're on your way to Midway, 1,300 miles east. On this leg you cross the international date line and lose track of time. If you left Wake Friday morning, you'll land at Midway Thursday evening. Midway consists of two small islands surrounded by a coral reef. On the larger is a cable station which, until the arrival of Pan American, was the only form of habitation. Now there's a hotel with dining rooms, lounges, porches and showers to accommodate forty-eight passengers. Here is a miniature forest of Australian pines, the result of thirty years of effort by cable company employes. Here also, ironically, are three graves of three doctors who, in the course of a quarter



PILOT and co-pilot on the flying bridge of the China Clipper. Below, interior of Clipper ship, showing berths. The China Clipper has space for forty-eight passengers on short hops, but on the long haul from San Francisco to Honolulu it carries twelve passengers and a crew of five.

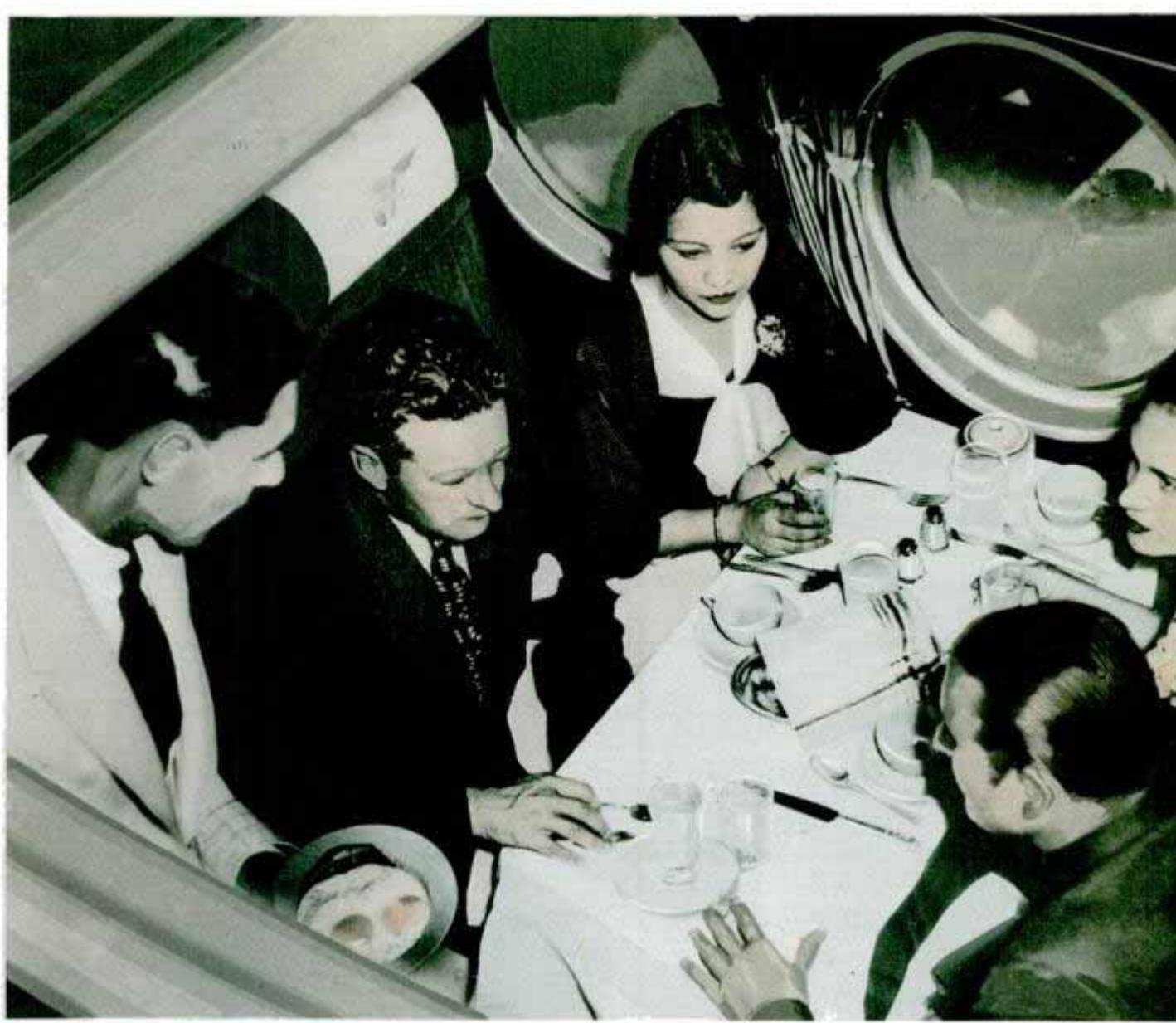
of a century have come to the island to look after the health of these employees.

There's a sand golf course, seals basking in the sun on the beach and there are gooney birds—creatures about two feet tall which carry on a ludicrous and amazing dance. There is a regular routine to the dance—papa and mama gooney address each other, bob heads up and down, put them side by side and click beaks, then reverse sides, jump up and down and scream. A gooney dance is worth a trip around the world to see.

If you tire of gooney birds, try collecting shells. If you're lucky you may find a great glass ball used by some Japanese fishermen as a net float. It started its voyage in Japanese waters and followed the Pacific currents all the way to Midway.



From Midway it's a 1,400-mile hop to Honolulu. On this jump you'll see little strings of coral islands from which thousands of birds rise and if you're flying low you may discern the remains of a vanished civilization which built its temples on some of these islands. You



DINNER time aboard one of the Clipper planes operating in South American service. All meals on the China Clippers also are "on the house."

land at Pearl Harbor and have time to become acquainted with the capital city.

The flight from Honolulu to San Francisco, 2,400 miles, is the longest of the passage and requires from fourteen to twenty hours, so you will do some sleeping on this voyage. Comfortable berths are a feature of the Clippers. After a seemingly endless journey over water you'll sight the Faralone islands and soon after the Golden Gate and you land in San Francisco harbor—back in the good old U. S. A. It seems you're home, but you are still 3,000 miles from your starting point.

And the best, most luxurious part of your trip still lies before you. You hop from San Francisco down to Los Angeles, there to board the "American Mer-

eury," giant sleeper plane of American Airlines. It carries you to New York in sixteen hours—while you sleep. Boarding this twelve-ton flying palace is an event. You walk up a gang plank into a spacious cabin divided into sections with facing seats like a Pullman car. Up front is aviation's pride, the "sky room" or private drawing room. Opposite it is the "flying kitchen." In the rear are separate dressing rooms and lavatories for men and women.

As your hotel with wings soars aloft you see up front a secretary collaborating with his employer in preparing correspondence on a noiseless portable typewriter—part of the equipment of this flagship of the American Airlines fleet. As you pass over Arizona the stewardess serves a six-course chicken



CONQUEST of the Pacific—a China Clipper leaving San Francisco on the first lap of its long journey to Manila, 8,000 miles distant.

336
336
dinner on individual tables with linen tablecloth, silverware and even real china. There's a brief stop at Tucson and soon after, the big ship takes on the appearance of a Pullman at night. Day sections are converted into berths, uppers are pulled down from the ceiling, bedding appears as if by magic, curtains are stretched and long before the "Mercury" lands at Dallas, all the passengers are sound asleep.

It's close to dawn as the "Mercury" settles briefly at Memphis but the sun is up before the first "early bird" among the sleeping passengers shows himself to get first chance at the electric

razor in the men's dressing room. Over Pennsylvania breakfast is served and soon thereafter the "Mercury," the last word in elegance and luxury in the air, settles onto Newark airport.

And you're home—back where you started from—around the world in three short weeks!

Of course, most persons traveling around the world by air prefer to make a more leisurely journey with stopovers along the way and that is easy to arrange.

And now, one word of disillusionment. Don't make a trip around the world by
(Continued to Page 132A)

House Paint in Rolls Applied Like Wallpaper



*Top, left, brushing on cement. Bottom, applying the cloth-backed paint.
Top, right, trimming to fit at ends of the boards*

Now undergoing weathering tests, outside house paint in rolls may appear on the market within the next twelve months. Prefabricated by experts, the paint rolls are applied like wallpaper. Of particular importance is the possibility of its application to wooden surfaces which have deteriorated. The rolls cover cracks, blistered paint and splintered spots more satisfactorily than several coats of paint. In experimental form, this product is little more than oilcloth. In fact, a good grade oilcloth might be used for this purpose, but it is not so suitable for weathering as outside paint in similar form. The cloth base has four to six coats of paint. The wall is prepared by coating with a special rubber cement. Then two workmen open the paint roll and hang it horizontally. With a soft brush the paint-covered cloth is pressed into place, following the contour of the wall surface. The material is pliant enough to follow irregularities. The makers expect it to with-

stand the elements from ten to fifteen years. Present plans call for the paint rolls to be marketed at prices below those jobs where paint is brushed on. In addition, the rolls can be applied more rapidly than two or three coats of paint.

CThe first suspension bridge was built across the Schuylkill river near Philadelphia in 1816, an eighteen-inch pedestrian span 410 feet long.

Compressed Air May 1936

During development by Standard Textile Products Co. you have been helping us.

Berlin-Weisse-See
Mirror on Lineman's Pole

Helps Examine Insulator

F1599.



Inspecting insulators on transmission line from every side by means of adjustable mirror on pole

Big brother of the tiny mirror your dentist uses to examine your teeth, a mirror mounted on a six-foot pole is used by linemen to inspect insulators on high-power transmission lines. The handle is hollow, and a rod inside it and a knob on the lower end manipulate a universal joint at the upper end by which the mirror can be adjusted to various angles for inspection purposes. The pole is of Bakelite, lightweight and non-conducting.

Machines Create More Jobs Than They Destroy

F1620 That jobs increase as industry puts more and more machines to work is borne out by a recent survey. The making of a modern automobile now requires twenty-five per cent more employment per unit car than it did in 1929. Instead of robbing operators of work, the dial telephone's introduction was accompanied by an in-

crease in the number of operators from 190,000 in 1920 to 249,000 in 1930. Advances in transportation in airplanes, automobiles, trucks and busses have decreased the 1,000,000 peak employment of railroads, but have increased over-all transportation employment by the addition of 2,700,000 truck drivers, 153,000 bus operators and 301,000 highway maintenance workers. Despite advances in textile machinery, one-third more workers are making women's clothing. Introduction of sound motion pictures and radio brought an increase in the number of musicians and music teachers from 130,000 in 1920 to 165,000 in 1930. Actors have increased in number from 20,000 to 37,000; theater ushers from 5,200 to 12,461, and there are 15,000 people on radio payrolls in jobs which never existed before. The number of ice dealers in the nation increased from 8,000 in 1920 to more than 19,000 in 1930, although gas and electric refrigerators had been expected to reduce jobs in that field.

F1528.

Flying Ability Shown by Timer Without Leaving Ground

With the aid of a reaction timer, the aptitude of a prospective army aviator for flying can be tested without taking to the

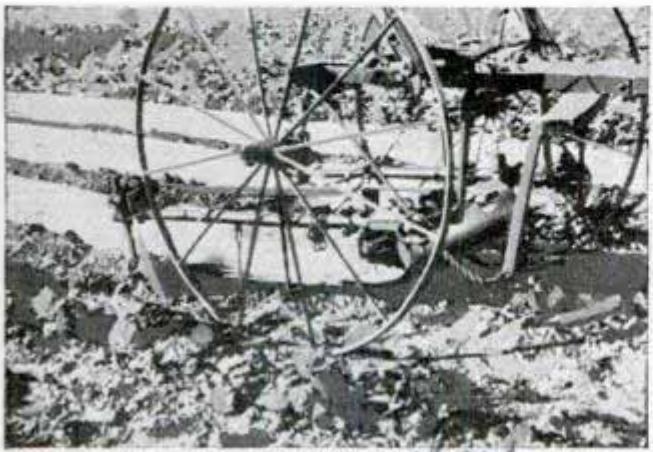


Flashing lights show how fast this student pilot reacts to forty different situations

air. The timing apparatus presents forty different situations in seven minutes to the prospective pilot and indicates the results by means of flashing lights. The equipment, constructed by the research department of the school of aviation medicine at Randolph Field, Tex., helps to show whether the time required by an individual to react to a situation is fast enough so he can safely be taught to fly.

Paper "Overcoats" Put on Plants by Machine

Designed to save truck gardens from damaging cold weather, the latest machine quickly puts paper "overcoats" on plants. The paper is laid in long strips wide enough to cover ordinary garden produce. An acre of plants can be protected in thirty minutes as the high-wheeled machine passes down the rows. Cost of the paper will be less than ten dollars per acre, compared to two or three times as much when dirt is used.



Machine unrolling strip of paper to cover plants as the temperature drops

Fire Engine Hurls "Snow" on Gasoline-Drenched Plane



Top, many-wheeled truck with special nozzle to spread chemical froth on gasoline blaze. Below, airplane fire quenched in thirty seconds

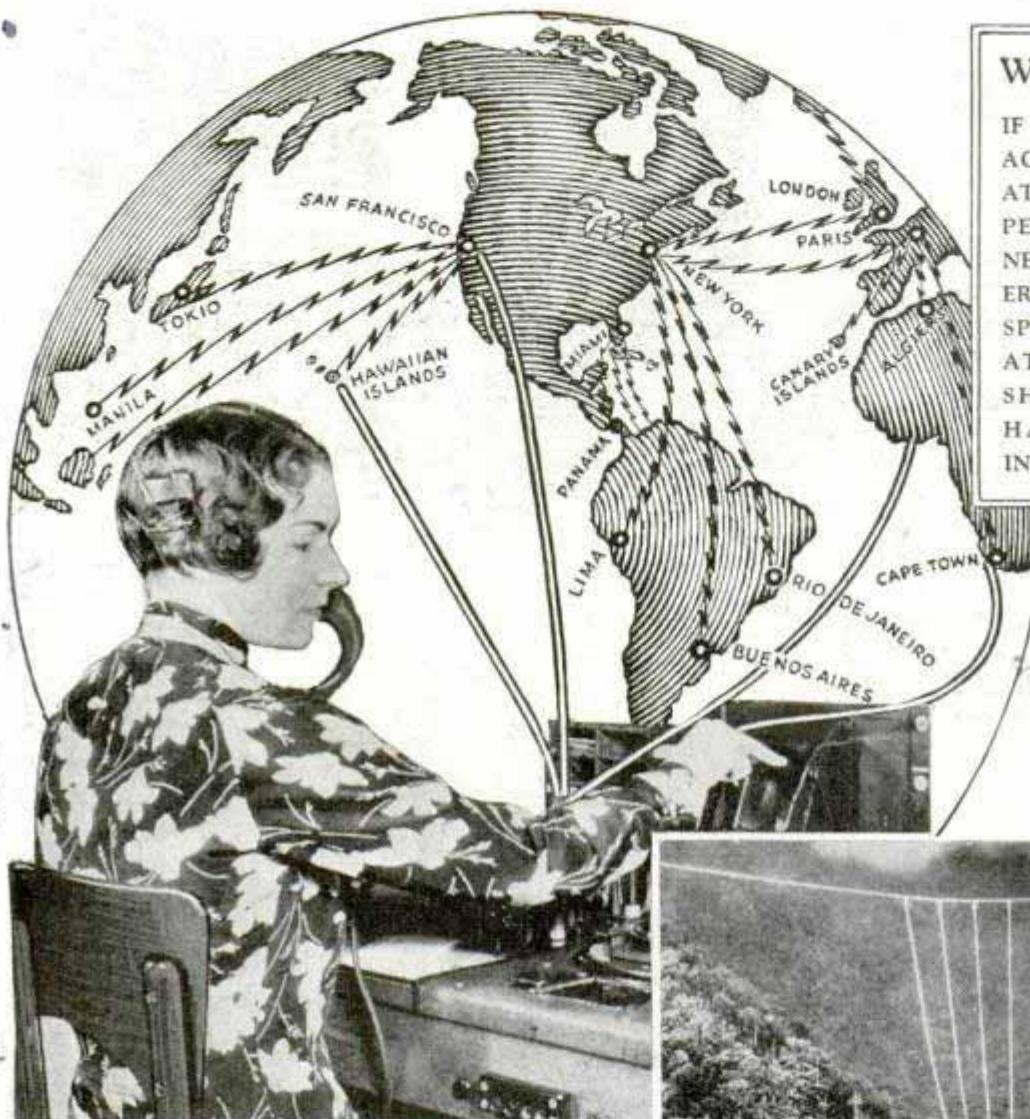
Thirty seconds after a gasoline-drenched airplane was set ablaze at Le Bourget airport, Paris, to test a new fire engine, the flames were smothered. The apparatus was designed particularly to fight airport fires and is mounted on a fast, multi-wheeled truck. Special nozzles blanket the flames with a veritable blizzard of artificial snow and chemical froth. This method has been found most effective in battling gasoline and oil fires.

Our Bureau of Information will answer questions regarding articles in this magazine, if accompanied by return postage.

Alfred Leitner

F159.8
Mr. Len Passman
4 W. 103rd St., New York

SCRAMBLED VOICES



What's Your W. P. M.?

IF YOU'RE JUST AN AVERAGE FELLOW, YOU TALK AT A RATE OF 125 WORDS PER MINUTE. BUT YOU NEED NOT BE A FAST TALKER TO SAY MUCH: LINCOLN SPOKE ONLY 267 WORDS AT GETTYSBURG, AND SHAKESPEARE PACKED HAMLET'S SOLILOQUY INTO 263 PICKED WORDS.

Transoceanic telephone operator and map showing terminals of radio telephone circuits. Below, transmitting station at Bandoeung, Java



IT IS a small world when you talk on the overseas telephone. Sixty-eight countries can be reached within a few minutes on circuits that lead from your home transmitter.

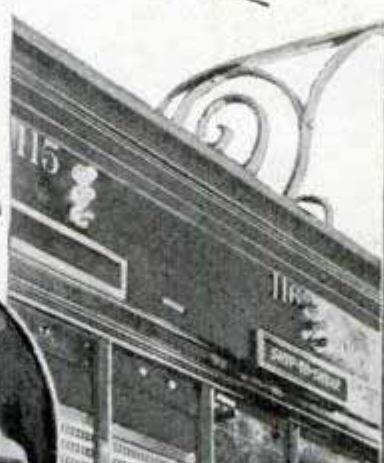
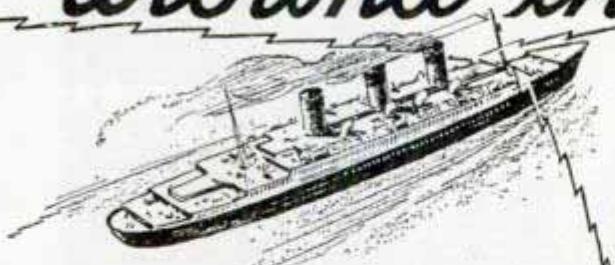
Man has flung great invisible "word-bridges" across oceans and continents, and united the earth into one compact unit accessible from your home, office, or ship stateroom. You can send your voice speeding around the globe in the time it takes your watch to tick twice.

Barely past its tenth birthday, the overseas telephone service has increased its volume of business by leaps. Last year saw virtually all previous traffic records shattered. In the first ten months of 1936, the volume of calls increased by more than sixty-five per cent over the same period

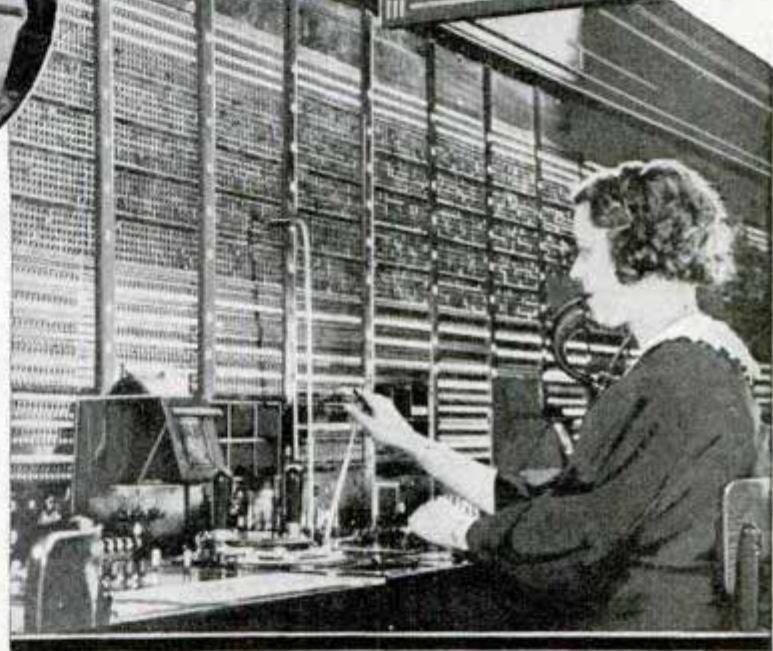
of 1935. Conversations to ships at sea showed a similar increase. Traffic through San Francisco, to and from the Orient, increased by about thirty-five per cent over 1935. Telephone business between Miami and Latin America increased by about 260 per cent over that of 1935.

All previous records for the number of calls handled in one day also were shattered when 127 were handled over the

around the WORLD

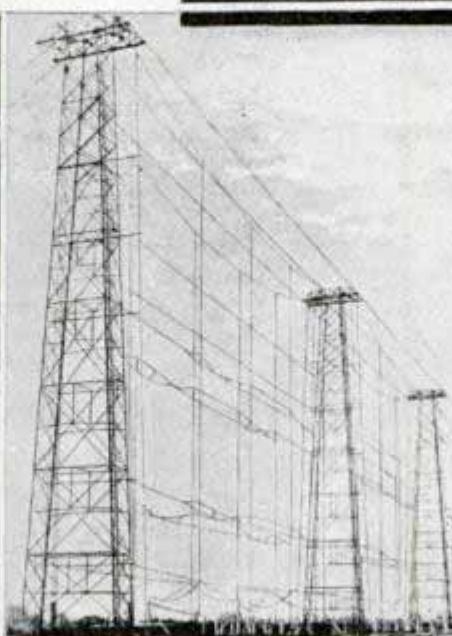


SHIPS AT SEA			
SHIP	ROUTE	TIME	FARE
HAMBURG QUEEN	EAST	8:30	THU
	SOUTH	8:30	THU
MONARCH	NORTH	8:30	SAT
AQUITANIA	WEST	8:18	TUE
CONTINENTAL	EAST	8:30	WED
CONTESSA VITTORIA	WEST	8:30	WED
NORMANDIE	WEST	8:18	WED
ILE DE FRANCE	WEST	8:18	THU
EMPEROR	SOUTH	8:30	FRI
EMPEROR	SOUTH	8:30	FRI
COLUMBUS	SOUTH	8:30	FRI



transatlantic circuits in a twenty-four hour period when France went off the gold standard in October, 1936. This figure was exceeded only by Christmas-day traffic and the telephone flood which burst when stock prices crashed in 1929.

More and more, ship passengers are using the ship-to-shore air



Above, talking from ship to shore, and operator at overseas switchboard. Below, Japanese transmitting station, antennas for circuit to Argentina and radiotelephone transmitting equipment

American Telephone & Telegraph



*File of foreign directories for reference in handling overseas telephone calls.
In the background are transatlantic telephone operators*

waves. Last November eighth, fifty-two conversations were held between ship and shore stations, an all-time record. Thirty-three of these conversations were with one ship. On her maiden voyage across the Atlantic, seventy-four conversations were held between the "Queen Mary" and shore stations, a record for one voyage. From records and reports it appears that the overseas telephone service is equally divided between business and social affairs. Overseas conversations have now become so vital to business that many firms are investing thousands of dollars annually in telephone tolls. While touring Europe recently, a New York business man listened by transatlantic telephone to the stock market pulse. On one occasion he established an all-time record of one hour and thirty-seven minutes of continuous connection. On another his call lasted for one and one-quarter hours. The two calls cost more than \$1,000.

The overseas telephone played a dramatic role during the recent illness of an American boy who was spending the summer alone in the small town of Blois,

south of Paris. One day his parents in Philadelphia received a message that he had been operated on for appendicitis. They asked to be connected by transatlantic telephone. The operator was unable to reach him at his house in Blois, so she tried to locate him at the only hospital there, but he was not to be found. Far from giving up, the operator reached out by remote control and literally ransacked the city of Blois until she located the bed-ridden son in a small clinic. But the parents in Philadelphia were unable to speak French with the clinic attendant in Blois. So the operator suggested relaying the message and connected the Philadelphia subscriber and the Blois subscriber with a "telephonist" in the London trunk exchange, where an interpreter translated the conversation.

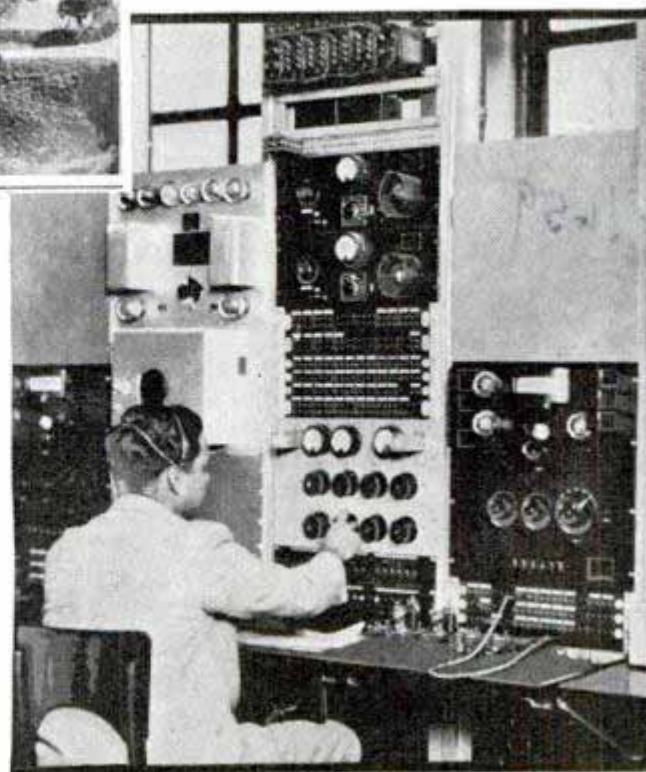
Business is now transacted by telephone on a world-wide scale. An American automobile manufacturer, with branches in South America, Asia, Africa and Australia, frequently calls his representatives by telephone. A Toronto miller, learning that a Glasgow merchant wanted a consign-

ment of high-grade flour, called him by overseas telephone and sold the flour for immediate delivery. The next morning a steamer left Canada with the flour.

An auto horn manufacturer in Jackson, Mich., devised a novel way of outwitting foreign competitors. He called a London customer by transatlantic telephone and demonstrated a new two-chime horn which he had just produced. He received a large order for his troubles. The same manufacturer coming home from Europe, called dealers in various parts of the country by ship-to-shore telephone and announced a forthcoming sales campaign. At the Paris fashion shows, it is now customary for American representatives to watch a parade of manikins and then telephone a description of the dress creations to their New York offices. At least one department store buyer shops around Europe without leaving his office in New York. On the overseas telephone he can buy goods in half a dozen or more countries in a day, extending his field of oper-



New York City
Above, overseas switchboard. Left, antenna of receiving apparatus for radiotelephone circuits at Hialeah, Fla. Below, operator in New York control room where wire lines to radio stations are concentrated



ations from Sweden to the Mediterranean.

When political strife breaks out abroad, the department of state usually calls our embassies and legations by telephone. At the time of the London economic conference, Washington held frequent telephone conversations with the American delegation in London. This proved helpful in shaping American policies at an international conference where events moved swiftly. The volume of telephone traffic varies with political and financial developments. Any declaration of financial policy, such as the abandonment of a gold

(Continued to page 154A)

F/16 22 Lineal Measures Computed with Yardstick on Wheels



Figuring cubic space in house by running a wheeled computer along the three dimensions

Taking the measure of your walls and flooring for the purpose of estimating air-conditioning, heating and carpeting requirements is made easy by a "yardstick on wheels." It is a wheeled computer with a long handle, which is rolled along the floor and up the walls, showing footage on a dial. This is a quick way of measuring cubic footage, and it is used, too, to figure footage of pipes.

F/16 59 Rifled Single-Ball Shotgun Shell Increases Accuracy Range



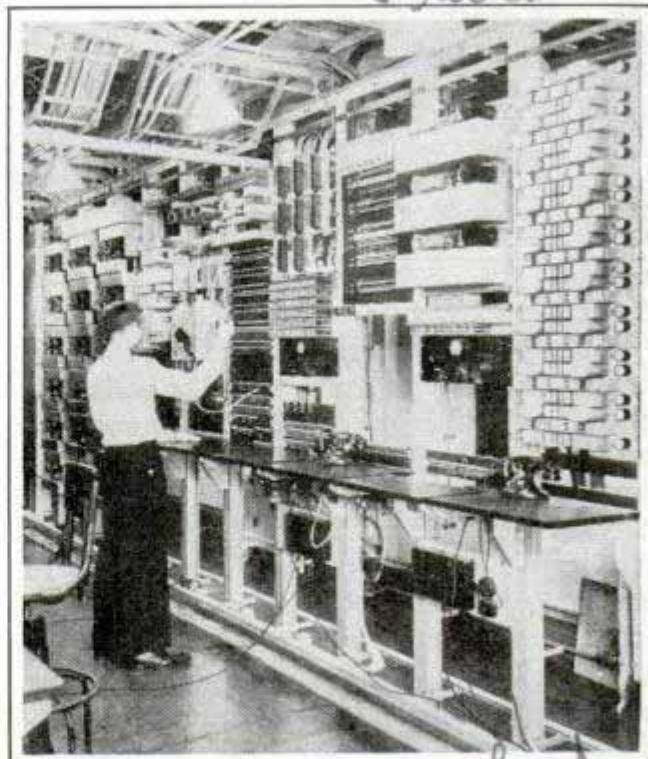
By rifling, a single-ball shotgun shell recently introduced doubles the effective accuracy range of a shotgun. Spiral grooves on the slug minimize friction inside the barrel and cause the ball to rotate

on its axis after it leaves the barrel, thus maintaining a more direct line of flight with sustained power than the round, smooth ball achieves. At the end of the slug is a deep cavity adding stability.

F/16 49

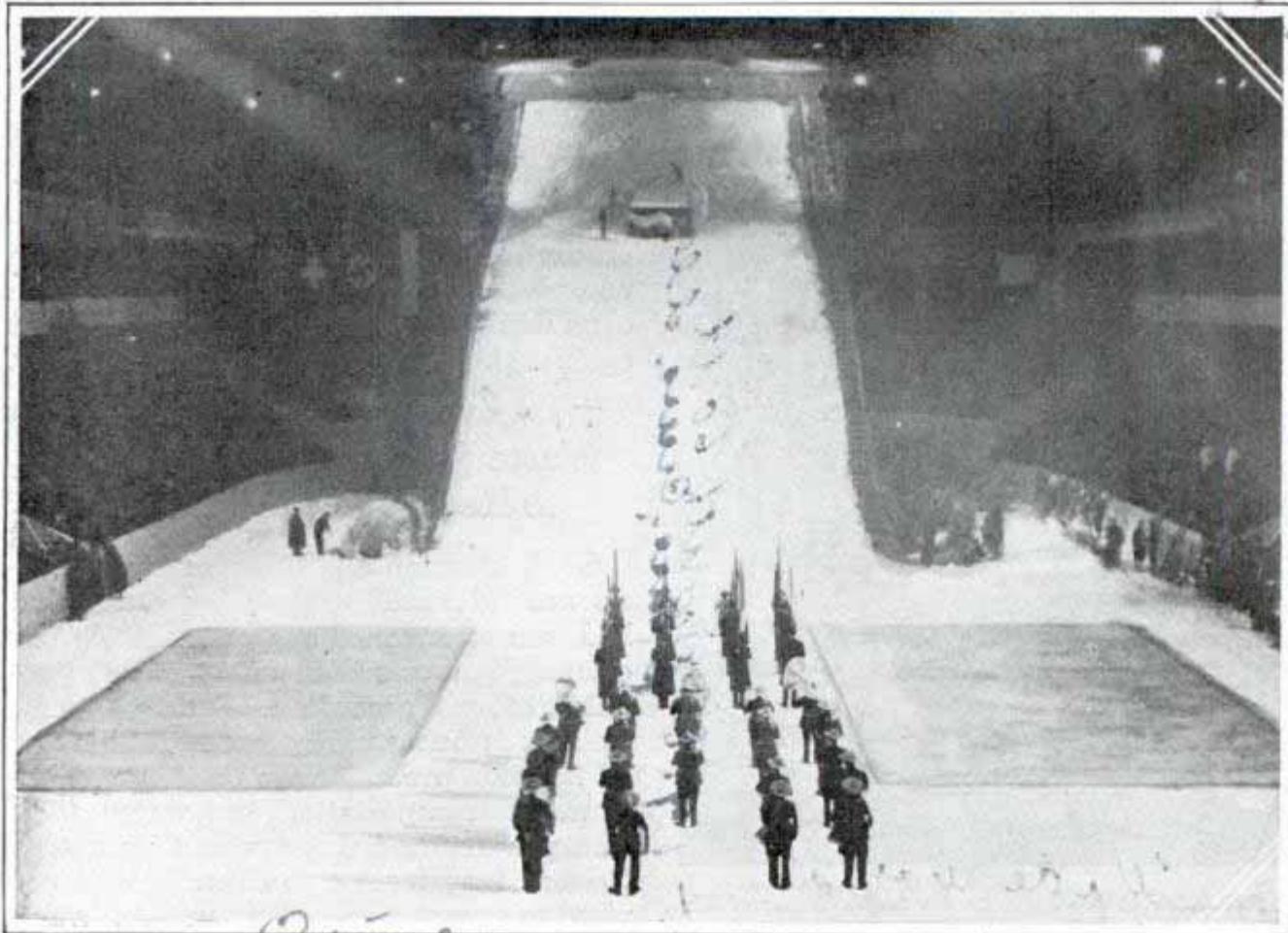
"Television Pipe" Transmits 240 Phone Calls at Once

Designed to handle 240 telephone conversations simultaneously, a coaxial cable, popularly known as a "television pipe," has been installed between New York and Philadelphia and recently was given a talking test by the Bell Telephone laboratories. Although the cable spans less than 100 miles, the circuit looped within it covers 3,800 miles. When used with the terminal equipment illustrated, the speaker's voice is split up twenty times between New York and Philadelphia. There are twenty loops in the circuit, each having a one-way amplifier. The voice passes through each amplifier twenty times, giving a total amplification of 400. At the sending end the various conversations are gathered together and sent over the one cable, then at the receiving end they are separated and sent along separate circuits. The cable also is adapted to the transmission of television.



Terminal equipment of coaxial cable which handles 240 telephone conversations simultaneously

Indoor Ski Jump Has a Realistic Arctic Setting



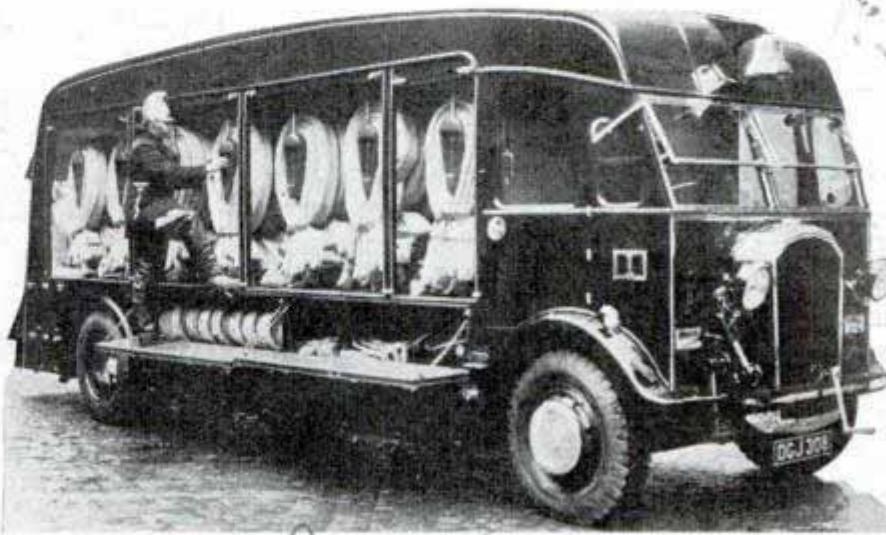
Arme
Ninety-foot indoor ski slide in Madison Square Garden, New York, made realistic by arctic landscaping. The band dressed in uniforms of Royal Canadian "Mounties" and imitation igloo was built at base of slide.

Arme
Even the band, dressed in uniforms of Royal Canadian "Mounties," was part of the wintry scenery when Madison Square Garden in New York City was converted into a winter sports arena. Ski jumpers

Arme
gave thrilling performances on a ninety-foot slide around which an arctic landscape was created. At the base of the jump was a papier-mâche igloo which added to the realistic effect.

Arme Mile and a Half of Fire Hose Is Carried in Special Truck

Designed for duty where long lines of hose must be laid because of water shortage or inaccessibility of hydrants, a special truck commissioned in London carries more than one and one-half miles of fire hose. The truck can lay one or two lines of hose at a speed of fifteen miles per hour. When not in use, the hose is folded in the truck, ready for unreeling on short notice.

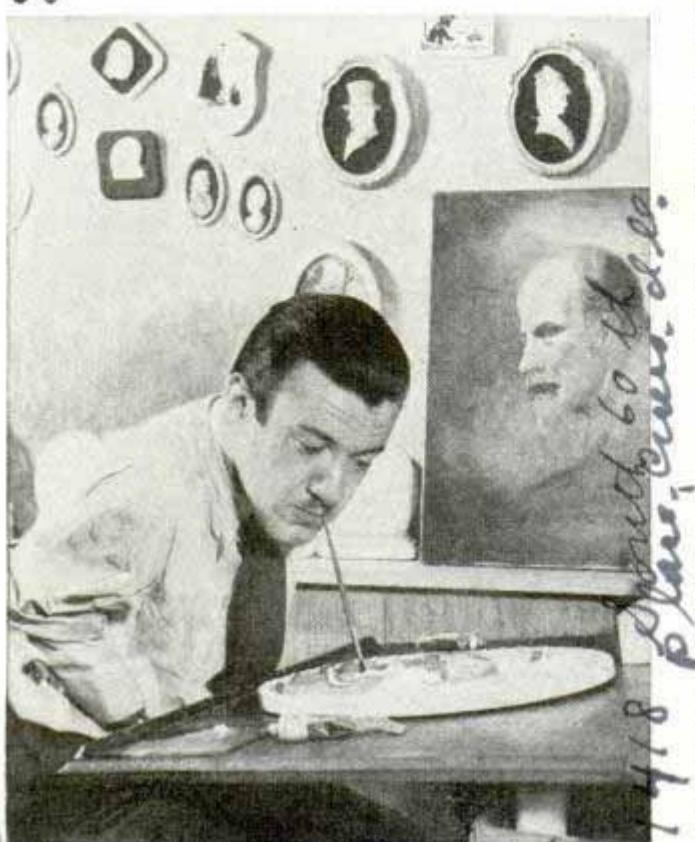


Arme
Here is how mile and a half of hose is stored in truck

Arme
Engineering Staff, London

Chicago, January 12, 1936

Armless Artist Uses Teeth to Wield Brush



Wide World
Artist holds brush between his teeth. Some of his work is shown on the wall

Cicero d il
Born without arms, Henry Welgman has overcome the handicap and now is an accomplished artist. He holds the brush between his teeth as he works on plaques and other art works in his shop, the walls of which are decorated with his paintings. The shop also offers the handicraft of other handicapped persons.

Water Squeezed into Solid in Pressure Laboratory

F1609
Squeezing water into a solid and other scientific tricks will be possible in the high-pressure laboratory being installed at Armour Institute of Technology. Pressures as high as 600,000 pounds per square inch will be exerted by equipment for studying electrical, physical, chemical and optical properties of materials. Under such pressure, colloidal constituents are precipitated, water compresses to half its volume and changes to a solid having a melting point of 212 degrees Fahrenheit, glass or quartz sheets one-fourth of an inch thick will bend to a radius of curvature of four

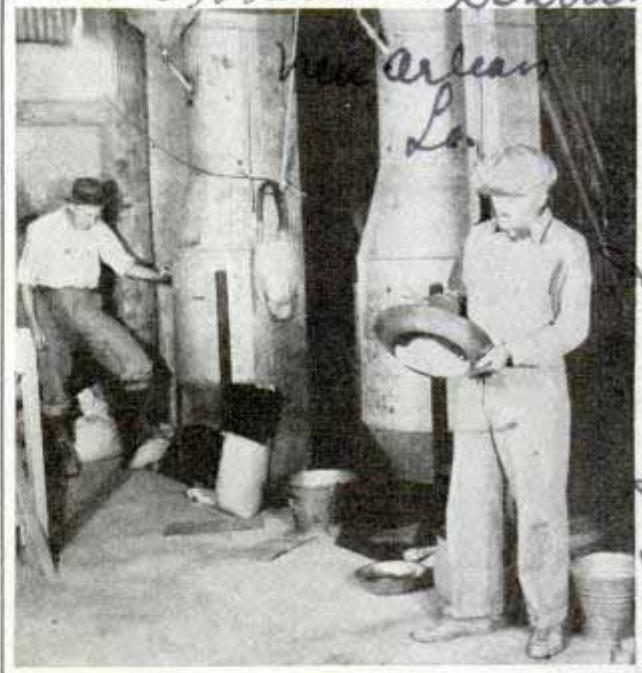
inches several times before breaking, and hydrogen gas will pass rapidly through the walls of a steel container. The structure of the steel is greatly affected, its tensile strength being reduced to less than half its former value. Under this pressure, the molecules are brought closer together and the atoms composing them are actually compressed considerably. Outside the laboratory, pressures of nearly half a million pounds per square inch exist under such conditions as thrusting a needle point against glass or rubbing two files together.

F1609.

Waste Sand Is "Dry Cleaned" to Recover Valued Metals

Gold, tungsten and other precious metals are "gleaned" today from sands that had been abandoned as worthless. A "dry cleaning" process that separates tiny particles of ore according to their atomic weights is being used where cyanide and oil flotation processes are uneconomic because of transportation and water costs. The new method was evolved by a New Orleans man from a machine he had devised to separate weevils from rice. Waste ore is crushed and pulverized to 120-screen size and fed into a concentrator. Metallic substances drop by gravity into a bin and the gangue or waste is sucked up by an air draft and cast off as tailings. If the ore

Mr. Frederic C. Schuman



New Orleans, La.
Examining gold dust recovered from waste sand by vacuum applied in the separating bins

Chemical Glassware

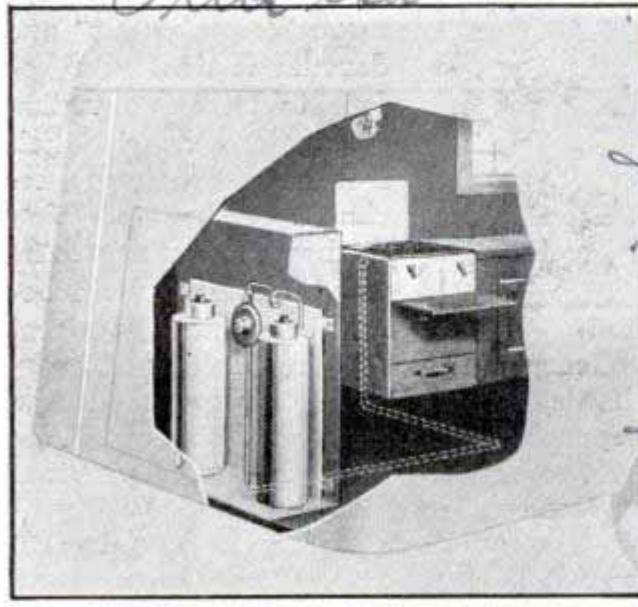
contains several metals of different weights, the tailings are passed through again, the process being repeated at different vacuum pressures as many times as there are substances to recover. The degree of vacuum is regulated by a gauge according to the atomic weight of the metal it is desired to separate.

F/6 36

Gas for Trailer Safely Stored in Bottles

Safety and convenience are two features of bottled gas equipment offered for trailers. Tanks, regulator and all high-pressure apparatus are located outside the trailer. In this position, the tanks are available for changing when empty. The two tanks provided carry a ten weeks' supply of fuel for cooking. Each cylinder has built-in safety plug and welded steel collar to protect the valve equipment. A steel cabinet, designed for mounting the cylinders with clamps to prevent rattling, is drilled for brackets to facilitate attachment to the trailer. Copper tubing and fittings for connecting the tanks to the stove also are included.

Trail. Gas.



Cutaway view of gas bottles in trailer. Dotted lines show connection to stove

Trailer Equipment Co.

Tractor Helps Launch Boat for Dutch Coast Guard Crew



Wide world
Dutch coast guardsmen starting out on a rescue mission, driving their boat into the surf on a specially constructed truck pushed by a tractor

Coast guardsmen at Muiden, in the Netherlands, have developed a new method of launching their heavy boats. The boat is loaded on a specially built truck and driven into the surf by a tractor.

F/6 77

Pipe Lines Second to Railroads in Ton-Miles of Cargo

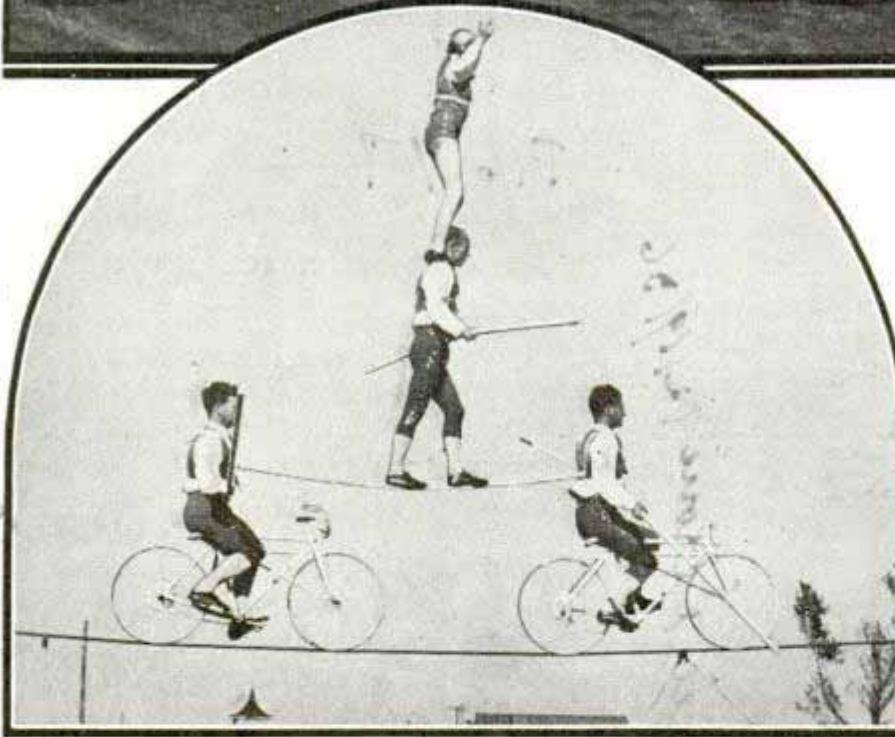
Although the public is seldom conscious of pipe lines, they rank second only to the railroads in ton-miles of cargo carried. There are 425,000 miles of sewerage pipe lines in North America; 312,000 miles of gas pipes lead to your kitchen stove; 211,000 miles of water pipes; 100,000 miles of petroleum and 65,000 miles of natural-gas transmission lines. Ranked according to ton-miles carried, the transportation systems of this continent stand as follows: railroads, 500,000 million ton-miles; pipe lines, 400,000 million; motor vehicles, 34,000 million; electric railroads, 11,000 million; inland waterways, 11,000 million, and airplanes thirty-three million.

Collins, Ontario
Research Foundation
Wolseley Motors

CA British automobile manufacturer lends a kit of spare parts to motorists taking a car of that make abroad, requiring only a nominal deposit which is refunded if the kit is returned intact.

F1597 Cmt. Emile C. Schinnermacher
727 Park Ave

The THRILL



Stunt driving is typically American. European daredevils concentrate on balancing acts

high wire artist emerged unscathed, the crowd gave a sincere sigh of relief.

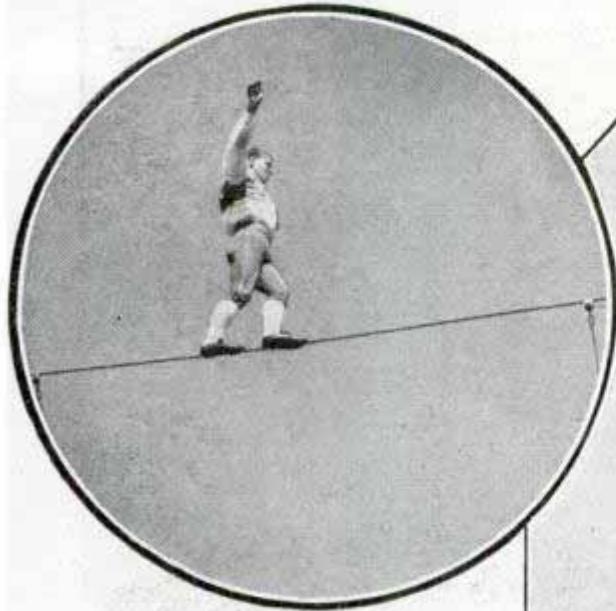
Last year, at fairs and carnivals, at circuses and expositions there were more "crash artists" and daredevils than ever before to thrill sensation seeking crowds with their feats. Who are these merchants of thrills? How do they get that way? Are they normal human beings or suicidal maniacs?

DURING the past year more than \$25,000,000 was spent by thrill seekers in the United States who came to see accidents which, somehow, just failed to happen. The majority came expecting, even morbidly hoping, to see daredevil performers crash to death or meet with severe injuries. But when the high diver, the glass crasher, the human bullet or the

George A. Hamid, king of the thrill merchants, is probably better qualified than anyone else to answer these questions. Last year his thrill dispensers provided excitement for more than 30,000,000 people who saw them perform at 300 fairs, 200 celebrations, thirty-five amusement parks and many civic carnivals, homecomings, circuses and other outdoor affairs.

3) J. Bernhard Schinnermacher

HUNTERS



*Carree's Levee
George Lorena'*



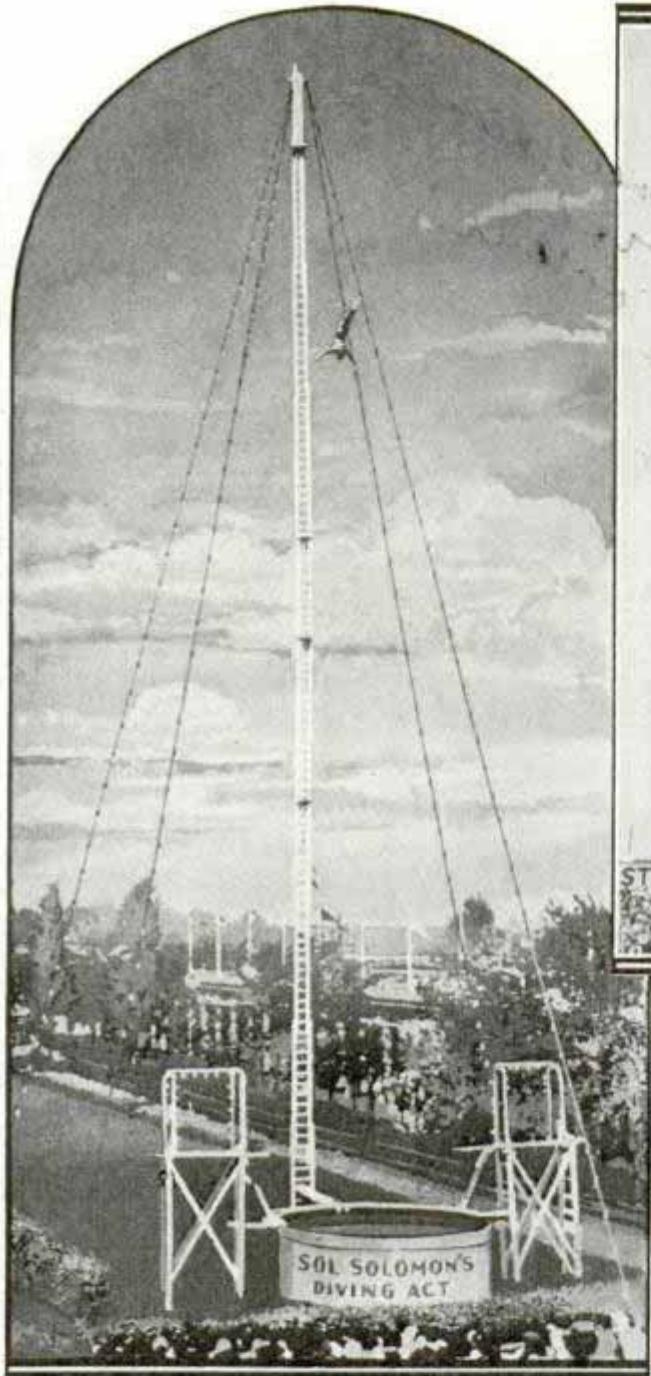
"The public wants the thrill provider to take his life in his hands every time he does his act," states Mr. Hamid, "The daredevil business has boomed as it never has before. One of the reasons for this, strangely enough, has been the great development in radio entertainment.

"All a person need do to get his fill of jokes, music and singing is to turn on his radio. When he sees performers in the flesh, he wants to see something different and he is most satisfied when he sees an act which provides the maximum in thrills."

As a result, the thrill providers have become increasingly daring. Twenty years ago a high diver who jumped into a shallow tank of water from a height of sixty feet was considered a **daredevil**. Today the diver must jump from a height nearly twice that



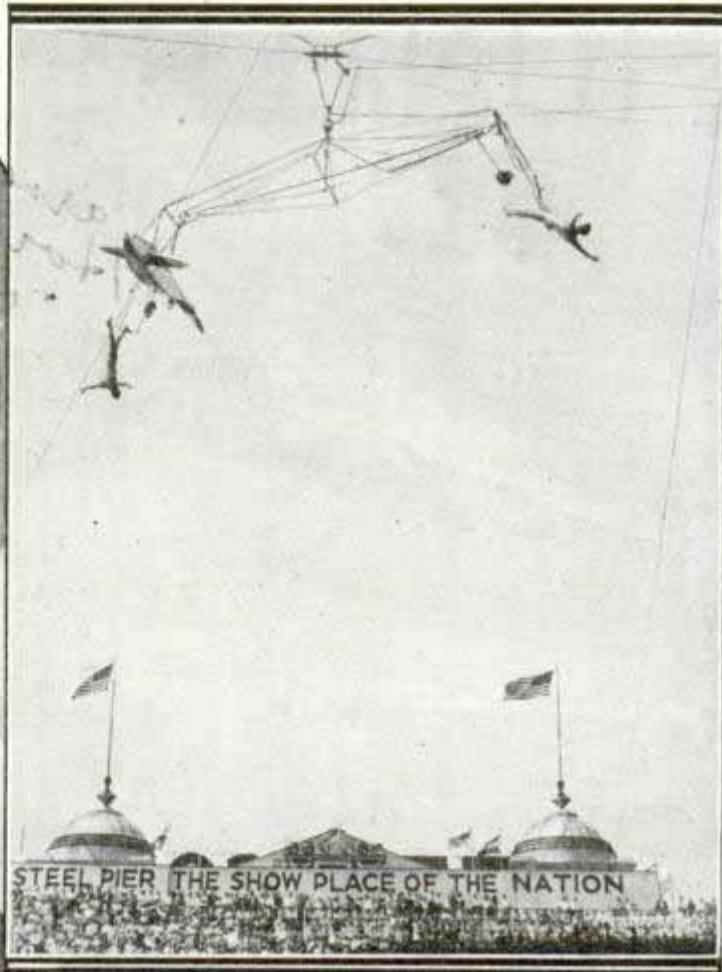
Crowds in the grandstand always fear the worst when the daredevils appear. Top, a high wire walker strutting his stuff, and a diving horse and rider on the way down



Sol Solomon diving 122 feet into shallow tank, and a hair-raising aerial trapeze act

distance to arouse real enthusiasm. Last year, at Palisades Park, N. J., Capt. Sol Solomon, "king" of the high divers, jumped 122 feet into a five-foot tank of water.

"A few years ago, shooting one man out of a cannon provided a great thrill," says Mr. Hamid. "Today, in order to provide the same enthusiasm, two men must be shot out. Aerialists and wire walkers who used to work at forty feet are now performing at 150 and 200 feet. New acts of crashing through glass on motorcycles, overturning speeding automobiles and jumping through flames are constantly being devised to give audiences new thrills.



Just how much more the daredevils are risking is shown by the increasing number of fatalities and accidents. From 1921 to 1934 only one daredevil was killed in the United States while performing. But since that time seven have been killed outright and an increasing number have been injured.

There are two principal reasons for these deaths and injuries. The first is over-confidence on the part of the daredevil who has mastered an exceedingly difficult stunt. It may be a glass-crasher speeding on his motorcycle at sixty miles an hour who neglects to crash through the glass exactly head on. Hitting at a slight angle, he is cut or killed. It may be a high diver who, after doing a dozen dives daily, relaxes his vigilance and doesn't hit the water in the shallow tank just right, suffering a broken back or blindness from a hard hit optic nerve.

A German daredevil named Brava, after having performed on a pole 200 feet high for two years without an accident, fell to his death from a height of only forty feet. He plunged from a rope on which he was descending from the pole a bit carelessly.



The second reason thrill merchants are killed or injured is because of some mechanical failure or lack of skill on their part while getting a new act ready or improving on an old one. Since mechanical equipment is constantly inspected, it is rarely that a tragedy occurs for this reason today as it did three years ago when an "iron-jawed" woman swinging 100 feet in the air supported only by the strap which she held in her teeth, came crashing to her death because her teeth had bitten through the strap.

Last season, however, when George Hirsch, the "Rocket Marvel of the Ages" tried to improve on the shot-from-the-cannon act, he met with disaster at Atlantic City. It was his idea to be sealed into a rocket and shot out into the ocean. The rocket was to be caught in a large net and he was to emerge. It cost more than \$8,500 to bring the act to Atlantic City pier. When the rocket was fired the first time, Hirsch received a broken leg.

Performers get into the thrill business in various ways. Some are literally born into it as their fathers and mothers were in it before them. This is particularly true of the high wire artists, aerialists, balancers, trapeze specialists and acrobats

Wilino



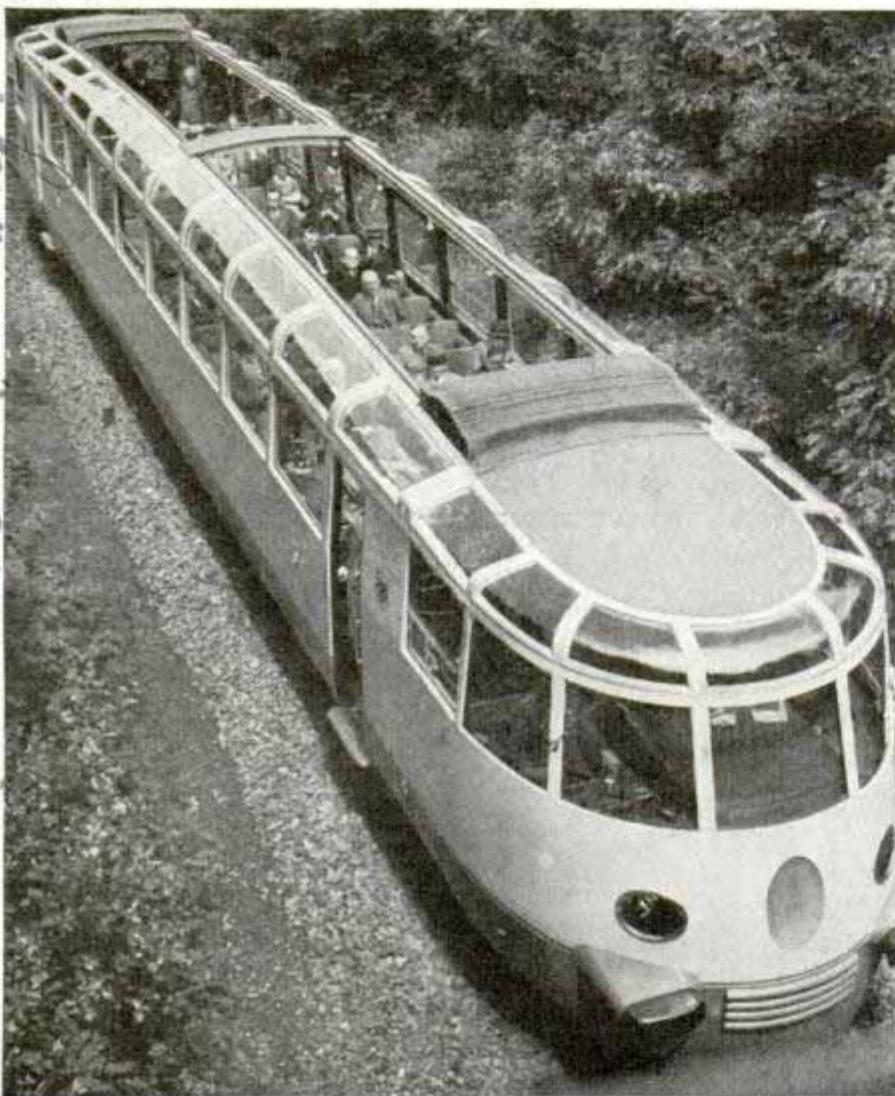
Crash acts, like the one shown, are popular with crowds in this country. Below, shooting man from cannon

many of whom are of foreign extraction. The American thrill merchants specialize more in such daring acts as high diving and jumps and crashes through flames and glass and over obstacles.

Among prominent American thrill merchants is "Lucky" Teter, first to do the

(Continued to page 140A)

Scenic Car's Roll-Back Top Improves Passengers' View



Scenic railway car is shown with top rolled back to give passengers a better view of beautiful mountain country

Diesel
Equipped with a roller-type roof, a scenic railway car introduced recently in Germany permits better view of the beautiful countryside through which the car operates. Windows extend around the sides of the car, which has capacity for sixty passengers on the run between the German Rhine and the frontier upland district of Eifel.

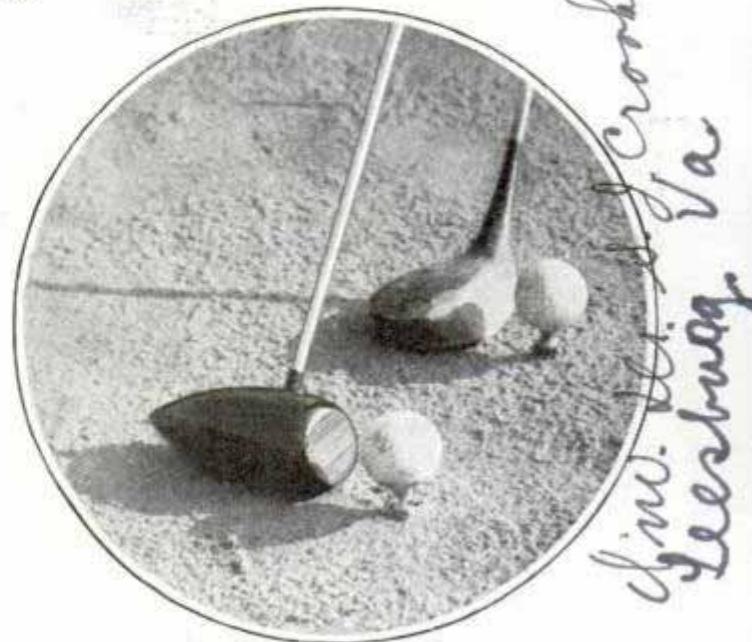
Rubber Paint Protects Fenders from Winter Damage

F1694
Rubber paint is being used to protect automobile fenders and other sheet-metal parts from injury by calcium chloride, which is commonly spread on streets and highways to combat ice and snow. Con-

tinuous contact with calcium chloride might damage the enamel finish. Rubber paint can be sprayed or brushed on the undersides of fenders and aprons, providing a surface the calcium chloride will not hurt.

F1589 Teardrop Golf Club Adds Yards to Drive

Streamlining has now reached the golf club. A golfer who is also a physicist has invented a teardrop driving head for brassie, driver or spoon with which he anticipates adding yards to his stroke. A metal shaft is used, the club head being a cylinder of persimmon wood, shaped for the least possible air resistance. The bottom is slightly flattened and has a metal "sole." Golfers who have tried it say the club helps straighten out drives. The shaft goes directly into the central axis of the head without any crook.



Teardrop driver lined up beside conventional type

Pontiac motor div.

Lightweight Pullman Built Like a Skyscraper



Top, left, lightweight sleeping car. Note small windows provided for upper berths. Right and bottom, interior views showing arrangement of seats for day travel

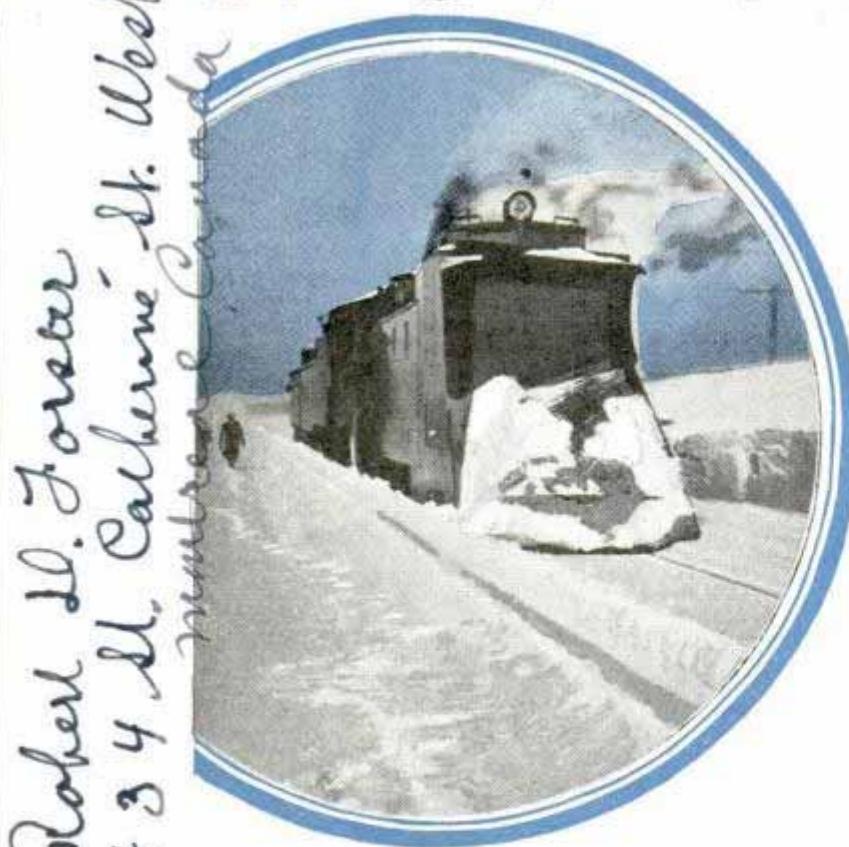
Constructed of alloy steel, the latest sleeping car is forty per cent lighter in weight than the standard car of the same capacity, carrying eight sections, two double bedrooms and two compartments. The car has windows for its upper berths, a feature of all the latest Pullman sleepers. Use of a truss-type of side frame to carry the entire load enables the builders to reduce the car's weight. A very light-gauged sheathing covers the frame, along

the lines of a steel skyscraper, the strength of which lies in the frame and not in the facing. The car's frame is entirely welded, eliminating the necessity of overlapping any of the framing parts, and thus avoiding any additional weight. Rolling steps, not visible when the train is in motion, and tight-lock couplers, with rubber draft gears that absorb the shock of starting and stopping and eliminate operating noises, are other features of the new car.

The Pullman, G. 798 Adams



FISI SNOW FIGHTERS



Encl. Robert D. Foster,
1434 St. Catherine St. West,
Montreal, Canada

Top, railroad plow churns through drifts that nearly buried telephone poles along right of way in Wisconsin. Sometimes it takes three or four locomotives to bore through. Below, a wedge-type plow

WHEN grandfather starts to tell you about the winter of 'eighty-eight and the blizzard that piled drifts above the kitchen window, stop him. Maybe it was more romantic in the old days when sleigh bells jingled on graceful cutters and you could guess the temperature by the high-pitched crunching of the snow under wagon wheels; but blizzards still do themselves proud today as they did in the 'eighties, and they pack a punch more paralyzing in this motorized age than when Dobbin pulled a sled.

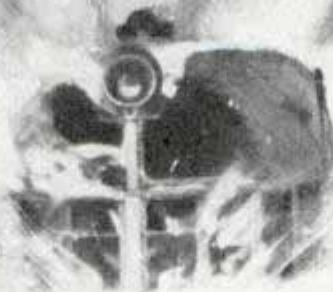
It has been estimated that a winter's snowfall costs this country more in economic loss than a year's destruction by fires. Death on icy thoroughfares; epidemics of disease, privation, even hunger in communities isolated by snow; millions spent by the railroads to clear their tracks, millions more to bore through highway drifts—these are a few of the items on winter's annual bill.

No one ever thought of plowing all the dirt roads open through the winter. Paved roads have put snow removal into

big business. Across the northern belt of states from Virginia, Missouri, Colorado and California up to the Canadian border, brigades of modern motor plows wage war all winter on blockaded roads. The existence of bus and truck companies depends on year-around open roads. Rural life hangs by the thread of transportation. A few decades ago the town-folks of Springville and the neighboring farmers took for granted that snow would lock their doors most of the winter, and they laid in a winter's supply of fuel and food. Sleighs could get through to town, and the town depended on the railroad. Today the



CLEAR the WAY



Burlington
Route



Diesel Power

© Burlington Railroad

Wonder what would happen if a streamliner met a snowbank? The pictures tell the story. What looks like an explosion is a Burlington "Zephyr" emerging clear after smashing through a snow-drift 300 feet long. The streamliner struck at eighty miles an hour.

Minneapolis

near See-ill.



community keeps smaller stocks on hand and expects the freight train and the highway truck to buck the drifts with daily supplies. A real, snorting snowstorm that even buries the snowplows can put a city in peril quickly.

A small town in Missouri was cut off from the world for an entire month last winter. Not on any railroad line, it depended on state roads for coal and grocery supplies, and when heroic highway crews finally fought through the drifts the 200 residents of the beleaguered town had but three days' food rations left and were burning shade trees and shacks to keep warm. The mayor of an Iowa city broadcast an appeal for help after seventeen days of isolation, reporting there was no bread, sugar, flour, kerosene, lard nor livestock feed and only a half ton of coal remaining. Rescue came when railway plows succeeded in cutting a hole through the white wall and freight cars rolled again.

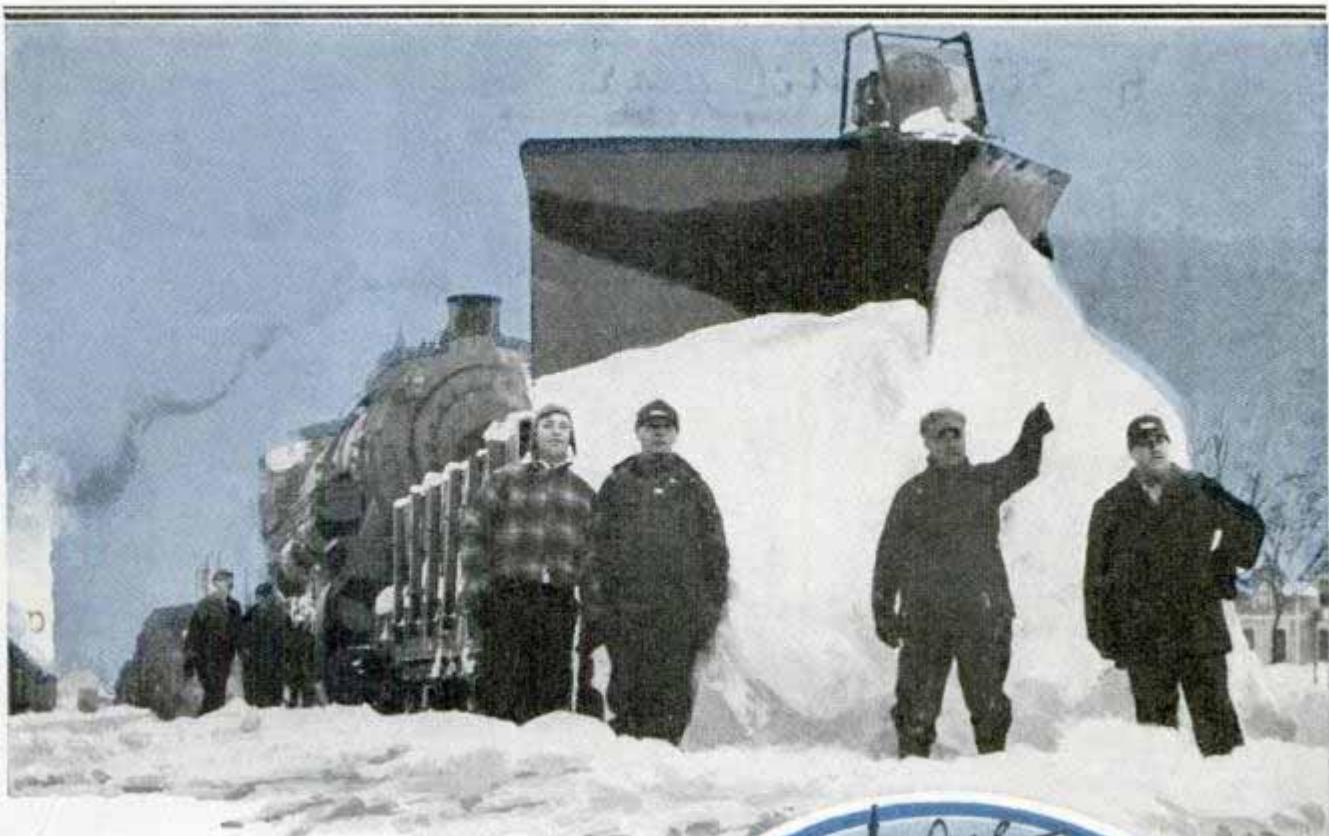
Trains must get through. There's no canceling of schedules for snow. As soon as the storm begins, the dispatcher sends out the fighting equipment: wedge plows that turn the drift aside as a farmer plows his furrow; V-type plows that ram the snow wall like a battleship cutting the



After the battle—the big iron horse, above, is home after fighting through a sub-zero blizzard. Center, clearing lines in the switchyard. Below, rotary plow pilots a passenger train

snow-fighters themselves are caught in the drifts, so crews of men with picks and shovels ride every passenger, freight and plow train to help dig out in the old-fashioned way. During the record snows that blocked traffic for days in February, 1936, five of the railroads operating north and west from Chicago kept nearly 250 plows and ninety other pieces of equipment blasting through the drifts at a cost of

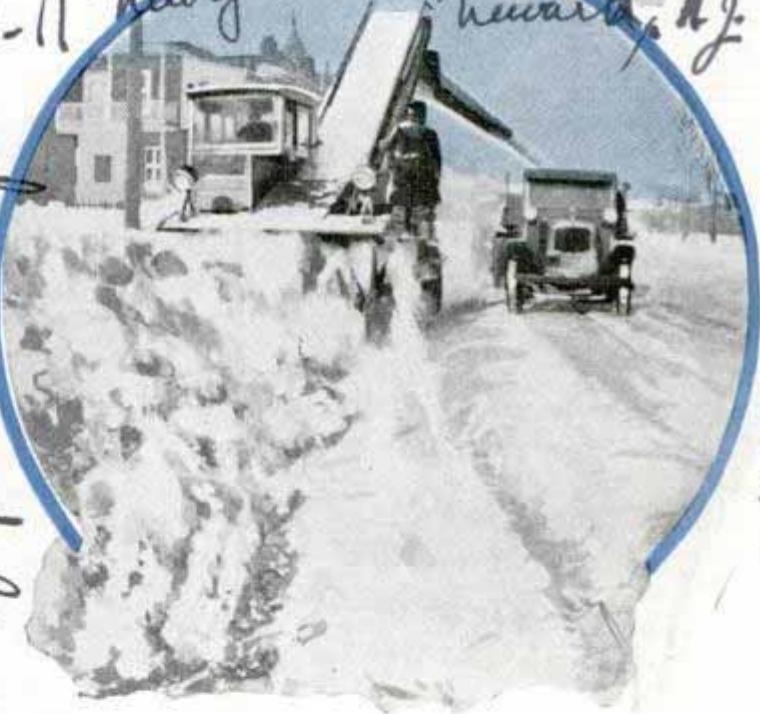
waves; powerful rotaries that churn snow mountains into flying clouds, and other specialized power apparatus. Among the latter are "flangers" which follow the big plows and cut a clean channel about eight inches wide just inside each rail—additional safeguards against derailment of fast trains by snow-packed rails. Often enough these modern



\$1,271,000 in labor alone. That's only part of the cost for one small section of the middle west. Multiply it for all the railroads north of Dixie, count in the Rocky Mountain snows that start in September and stop in May or June, and you add up a staggering bill.

Climb up the grade into the high Sierras from semi-tropical California and you bump into the biggest snow pile in the land. Five hundred inches of snow, some years, fall on the railroads and transcontinental highways where they cut through the mountain passes. Steep grades and curves on one line required a special plow, with a V blade and two huge rotors driven by a 200-horsepower gasoline engine mounted on a boxcar and pushed by a twenty-ton locomotive. As many as four locomotives have teamed up to shove a single plow through Wisconsin drifts. In what is called the "Thaw Belt," roughly between lines drawn east and west through Albany and Indianapolis, intermittent freezing and thawing results in ice-encrusted highways, and snows frequently are wet and heavy, packing down

9-11 New York Ave Newark, N.J.



Top, a "V" plow mounted on a flatcar. Bottom, automatic snow-loader clearing a city street. Revolving disks feed the snow piles to an endless conveyor which loads two trucks per minute

into barriers that stop a plow dead. But for heartbreak work take the throttle of a giant rotary plow as it bears down on a dune of "sugar" snow looming twenty to thirty feet above the track. Light, powdery stuff, it is blown aside by the whirling blades and you bore steadily through,

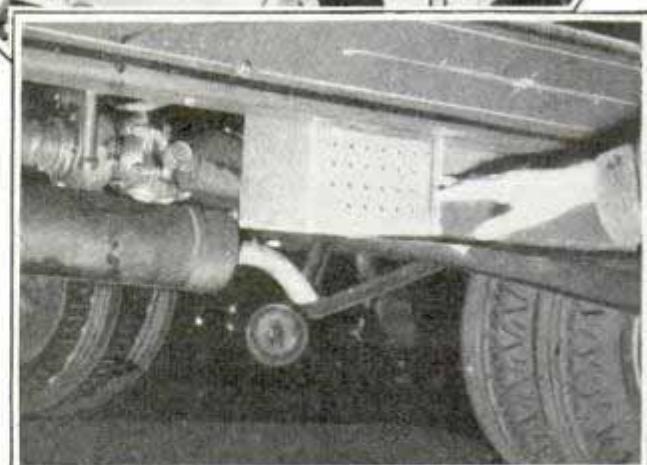
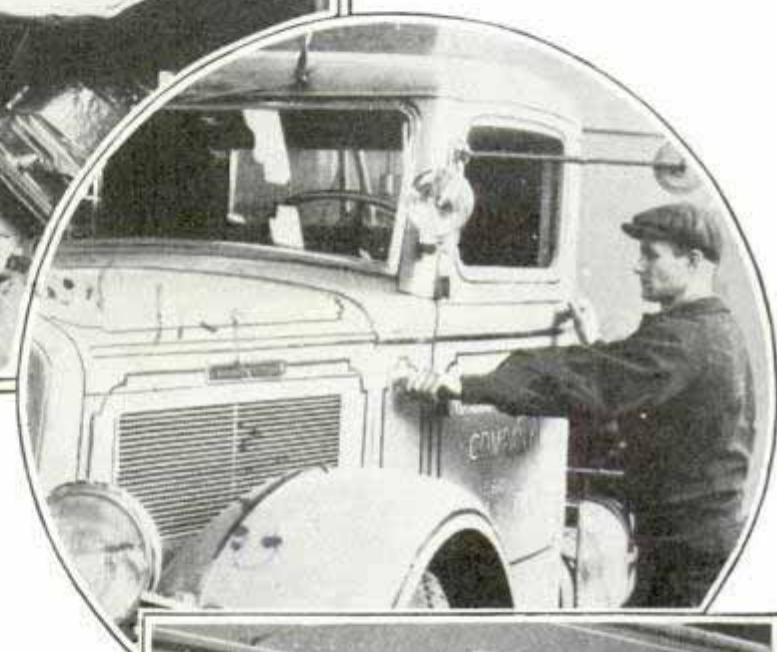
(Continued to page 144A)

Secret Time Alarm on Truck Stops Hijackers

\$150.00 last year



Left, truck driver pressing secret combination of six hidden electric buttons before starting motor. Steel case has been removed to show the heart of the alarm system. Center picture shows driver turning key of timing device before entering cab. Below, siren mounted under truck



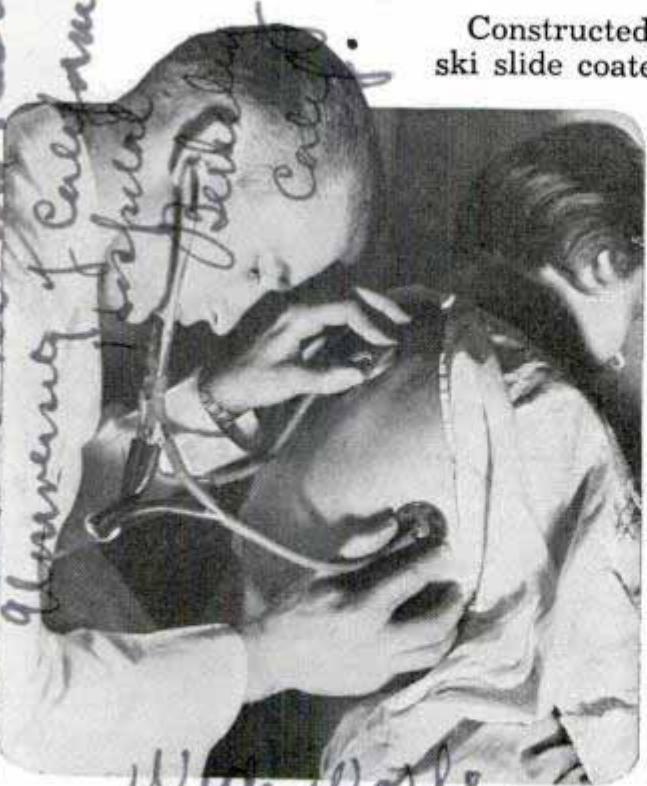
To baffle "pirates" of the highway, trucks laden with precious merchandise are being equipped with a secret combination alarm which stops the engine abruptly and sounds a piercing siren when cargo or cab is attacked. The electric timing mechanism is always in operation, even when the truck is parked in a garage, and any attempt even by the driver to start the engine, enter the cab, tamper with doors or with the alarm system itself will set off the alarm unless the secret combination is worked properly. This combination is known only to the driver and can be changed only by the manufacturer. When a truckman starts out with his valuable load of silks, drugs, cigarettes, tires or other goods, he must first turn a key in a lock in front of the cab door. Then he must enter the cab and within a given number of seconds press a certain combination of six electric buttons concealed in a steel box on the instrument board. This done, he can start the motor and proceed. If he fails to work the combination within the allotted period, the timer will sound the alarm and it cannot

be stopped immediately. The driver can shut it off after a period of time by proper manipulations. If hijackers open the cab door or the door to the cargo, or attempt to cut wires of the alarm, the siren will blow and continue for four to six hours to utter a shriek audible for several miles. It is operated by a powerful storage battery mounted under the truck. All wiring is

encased in steel pipe, the siren and battery being inclosed in hardened, drillproof steel cases with special baffles. No two trucks have the same combination. The human element is minimized, for the alarm is automatic and needs no motion of the driver to actuate it.

F1559
**Twin Microphones
in Stethoscope
Aid Diagnosis**

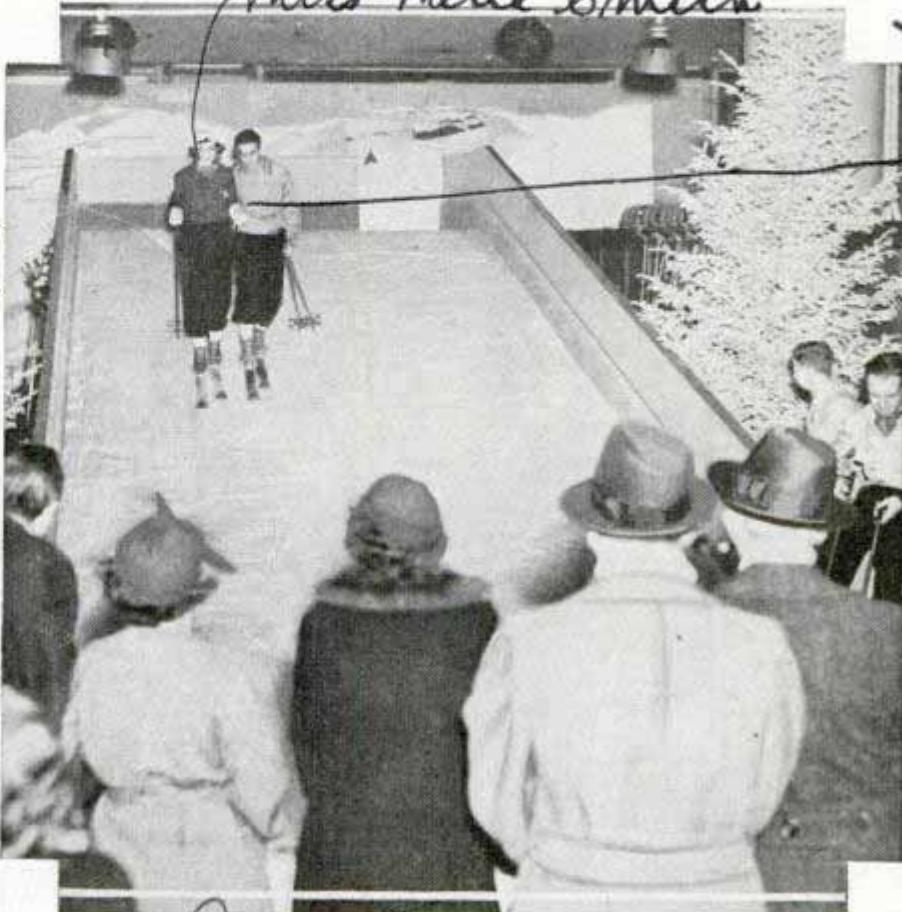
Equipped with two microphones and four tubes, an improved stethoscope not only detects the location of noises but tells in what direction they are traveling in the human body, greatly aiding in diagnosis of the disease. The twin microphones, both extremely sensitive, pick up sounds more quickly than the single-detector stethoscope used for many years.



More accuracy in locating and diagnosing human ailments is claimed for this improved stethoscope

F156
**Ski Slide Coated with Borax
Is Constructed Inside Store**

Mrs. Merle Smith



Acme
Here are two demonstrators coming down the borax-coated slide. This novelty helps to sell winter sports clothing and equipment

Constructed in the sports department of a large store, a ski slide coated with borax gives novices the sensation of skiing and permits experts to demonstrate. Borax facilitates movement of the skis on the slide. A winter scene painted on a backdrop lends a realistic touch.

**Foot Guard Made of Aluminum
F1592 Protects Workers**

Protection against injury from heavy objects falling on the feet of steel-mill and machine-shop workers is afforded by an aluminum alloy overshoe. Corrugated across the instep to give it strength and rigidity, this guard has maximum resistance to the impact of heavy objects.



Chicago Ilgenmarken

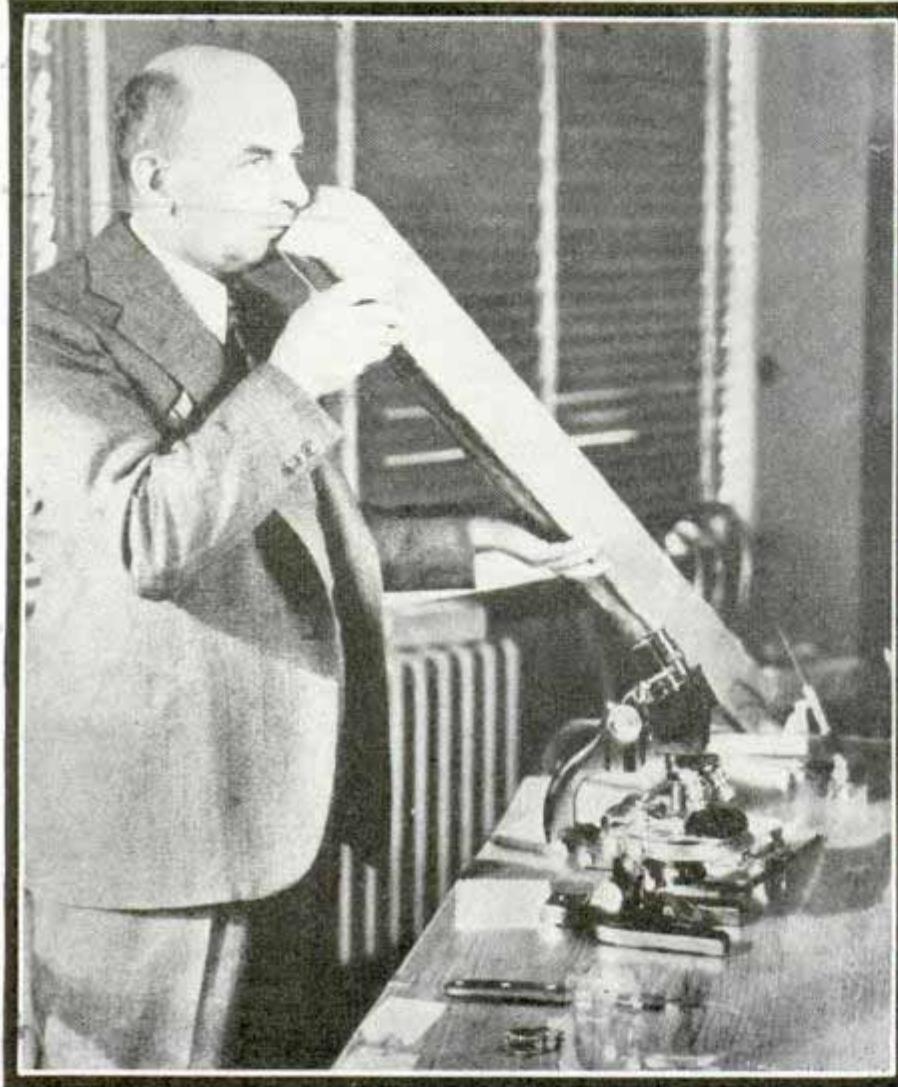
Marshall Field

Elwood Safety Shoes

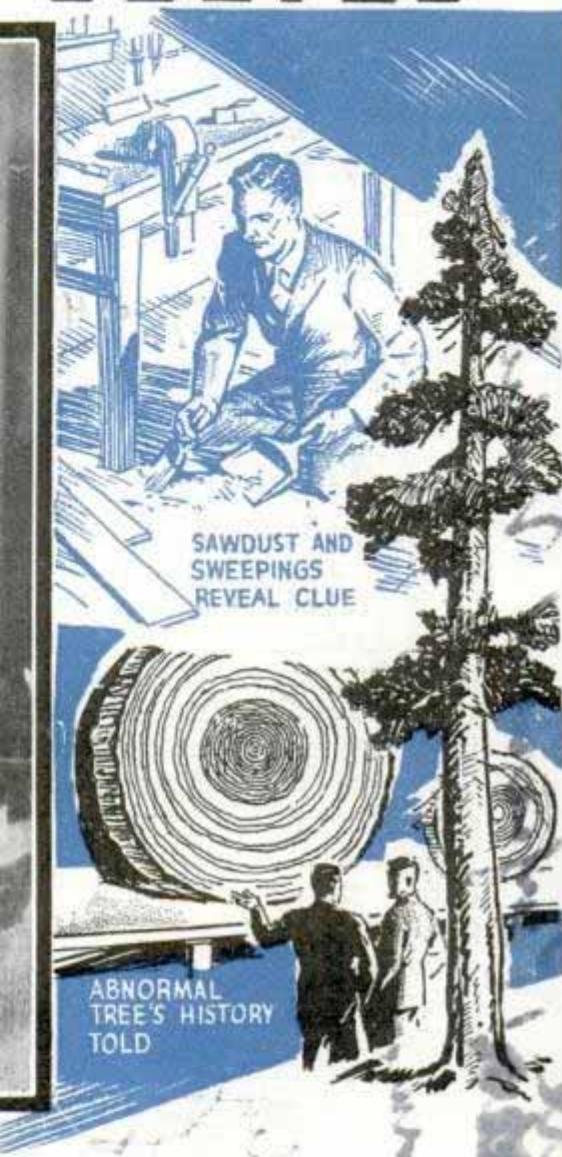
203

4639 Montgomery Ave
Baltimore, Md.

WOOD Detective SOLVES



Mr. Koehler identifying deck timber from yacht as northern white pine by its odor



SAWDUST AND
SWEEPINGS
REVEAL CLUE

ABNORMAL
TREE'S HISTORY
TOLD

A PACKAGE, addressed to a Wisconsin man, contained a crude homemade bomb which exploded and killed his wife when she removed the wrapper.

For weeks the case challenged solution. A few shattered remnants of the bomb, including some wood debris, were the only clues. Eventually the local authorities appealed to scientific experts of the state university for aid. That led to the appearance in the case of Arthur Koehler of the forest-products laboratory, a research agency of the U. S. Forest Service. Koehler is a trained technician, a specialist in the microscopic identification of wood species.

As a result of Mr. Koehler's study, the bomb was disclosed as an ordinary piece of gas pipe mounted in a block of white elm. The only suspect disclaimed all

knowledge of the "pineapple." He stated repeatedly that there was not a scrap of white-elm lumber on his farm; that he had never used any such material. Special investigators made an examination of his workshop. However, the shop had been swept thoroughly. Apparently not a clue remained. It was only after hours of inspection that they unearthed minute scraps of shavings and grains of sawdust from behind a leg of the workbench, trash which had escaped the broom. Just enough of the debris was found to cover the tip of your index finger, but still sufficient to send the suspect to prison for life.

Magnified to fifty times its normal size the material proved to be white elm. The cellular structure of each species of wood is distinctive to an authority like Koehler. The white-elm sawdust from the shop

3000 MYSTERIES a Year

PETRIFIED
WOOD IDENTI-
FIED

TRACING
HAUPTMANN'S
LADDER

TREE
GROWING
ON ROOF

WOOD IDENTIFIES
SUNKEN SHIP
CONTAINING
GOLD

YEAR AND MONTH
OF HURRICANE
REVEALED

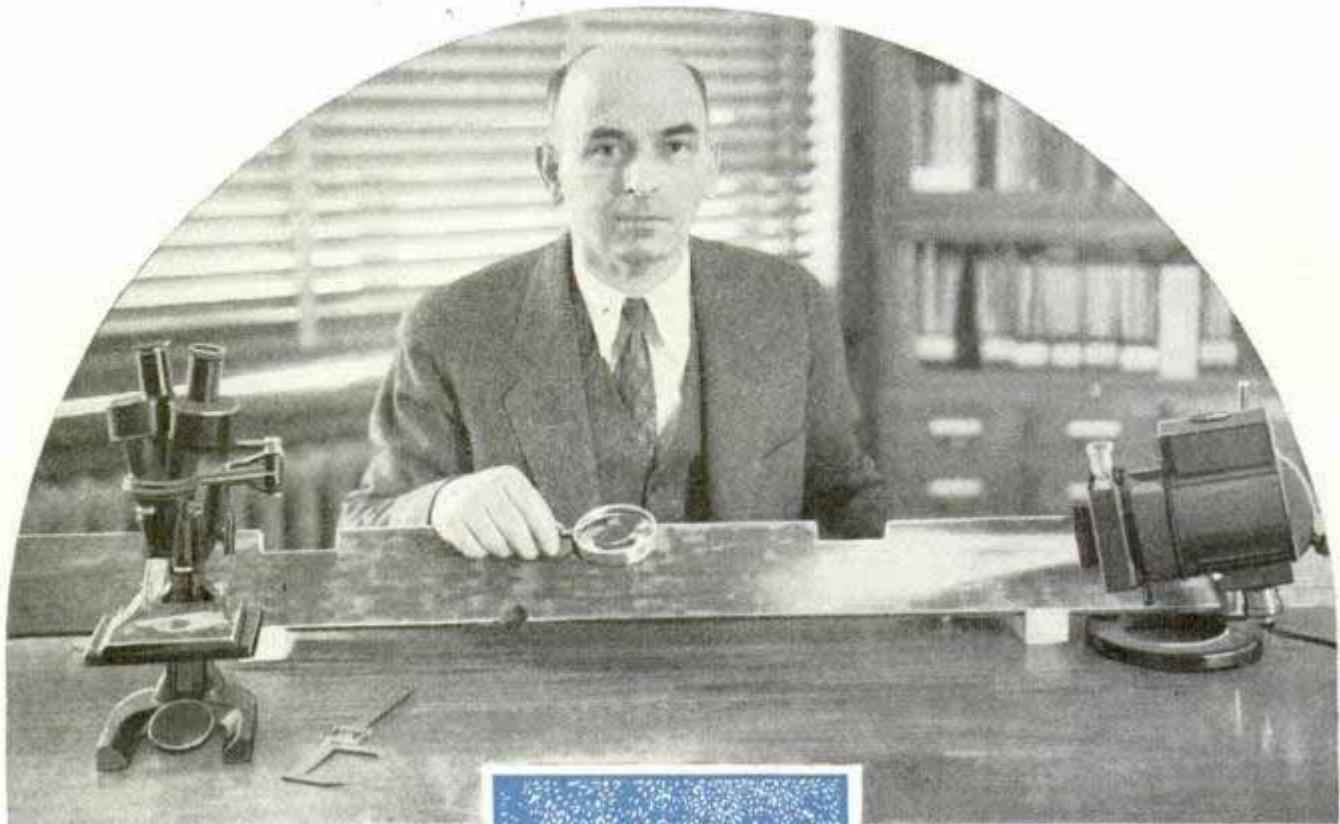
ELM ROOTS
CAUSE TROUBLE

F1570

matched conclusively with similar material from the remains of the bomb. Furthermore, fragments of the wood dovetailed as only nature can make such substances dovetail with shavings salvaged from the shop. During the trial in which Koehler was a witness for the state, he brought his powerful microscope into the courtroom. The jury, man by man, viewed the startling evidence in sensational form. The testimony of the microscopes supplemented by the technical explanations of the wood expert was enough for the jury.

A former president of a disbanded miner's union in a Pennsylvania town carried a package which he had received the day

Drawings representing some of the mysteries solved by wood detective, including source of wood used in Lindbergh kidnap ladder and identification of samples of wood from two sunken vessels to establish which was likely to be treasure ship



before into the kitchen of his home to open it. His young son and daughter followed. The package contained a cigar-box bomb which exploded, killing him and his boy and severely injuring the girl. About the same time, in another part of the city, another man also opened a box which exploded and snuffed out his life. Four similar packages were sent to others. Two were retrieved from the mails before delivery; one of the delivered bombs was not opened because of its suspicious appearance, another was opened the wrong way and failed to explode.

Several weeks of investigation led to the arrest of a man reputed to hold a grudge against one of the victims. Handwriting experts traced striking similarities between his lettering and that on the packages. In time Koehler was called in. His investigations resulted in matching the wood used in the construction of the bombs with similar material found in the suspect's home and shop. The growth rings as well as the resin ducts in the wood samples were identical as exhibited under extreme magnification. A definitely identifiable make of fish glue had been used



Mr. Koehler with some of his microscopes and other equipment he uses in wood identification

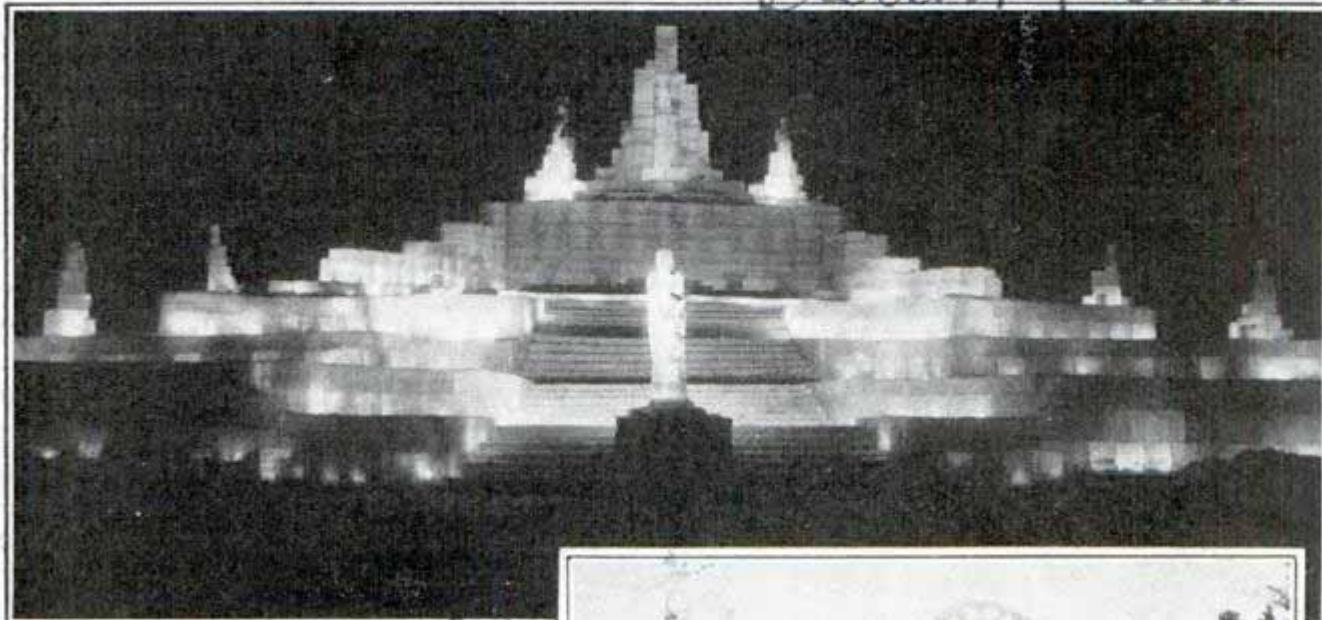
by the suspect in repairing a chair found in his home. This glue was procurable in but one store in the city. He had made such a purchase there. That kind of glue was also used in the bombs that did not explode and was found in the remains of the ones which did. Several sticks of dynamite like those in the bombs were found buried in the suspect's basement. An exact duplicate of the copper wire employed in the bombs was located in his shop. Fine nails which he used in resoling his

shoes were counterparts of those in the bombs. All this evidence was so clinching that the suspect was convicted of murder in the lower court. The case since has been appealed.

In the Lindbergh baby kidnaping case, Mr. Koehler identified all the species of wood employed in the homemade ladder which was left behind by the kidnaping. By studying the nail, tool and machine markings in the wood, he was able to trace the North Carolina pine uprights in the ladder to one particular planing mill by means of the number of knives used in the face and edge cutters and the rate at which the

(Continued to page 128A)

Ice Thrones Are Lighted by Concealed Bulbs



Two examples of the wizardry of ice sculptors. Top, illuminated throne of winter queen. Right, daylight view of another artistic ice throne

Spectacular illumination of giant ice thrones erected for winter sports carnivals in the northern United States is accomplished by placing electric bulbs between the snow and ice blocks from which the thrones are formed. A rheostat, a reducing gear, large crocks and lumber are utilized in changing the lights from one shade to another, with delicate pinks, blues and greens at the base of the throne, and yellows, purples, and lavenders at the top. To the spectator the lights seem to be buried in the throne. One magnificent ice throne created for the Petosky, Mich., carnival of last winter was 125 feet wide, 100 feet deep and towered seventy-five feet above the floor of the huge municipal skating rink. A feature of the structure, which contained 1,300 tons of ice, was the figure of an Indian woman sculptured in ice. The base of the throne was made from snow packed hard into wooden forms, then wet to a slush and allowed to freeze solid. After removal of the forms, huge slabs of ice were swung into place with a derrick, and water was played over the structure to cement the various parts through freezing. Each of the carnivals is ruled over by a Queen of Winter Sports who is crowned on the throne built from ice and snow.



F15 23 Metal Scrolls and Squares Cut by Pivoting Snip

Cutting scrolls, squares and odd shapes is as easy as cutting a straight line, with a metal snip now available. Its blades lie flat, opposite to the ordinary blades, and they pivot as they cut. It will cut galvanized sheets up to eighteen gauge.



Examples of shapes cut by flat-bladed metal snip

J. Wijes & Sons Co.

F 15132 *Photo: Kansas*
**Basketball Flashes a Light
 When It Drops for Score**



Ball trips metal loop as it falls through basket and turns on light momentarily, indicating a score

Red lights flashing behind the basket tell instantly when a basketball player drops the ball through the hoop for a score. When the ball goes through the basket it strikes a metal arm which turns on the light directly back of the basket and two other lamps above the corners of the back-board. The lights remain on for two seconds. This system is being used on some courts for the benefit of spectators seated in such a position that their view of the board is obscured.

F 1542 **Brine Pumped Back into Earth
 Boosts Oil-Well Output**

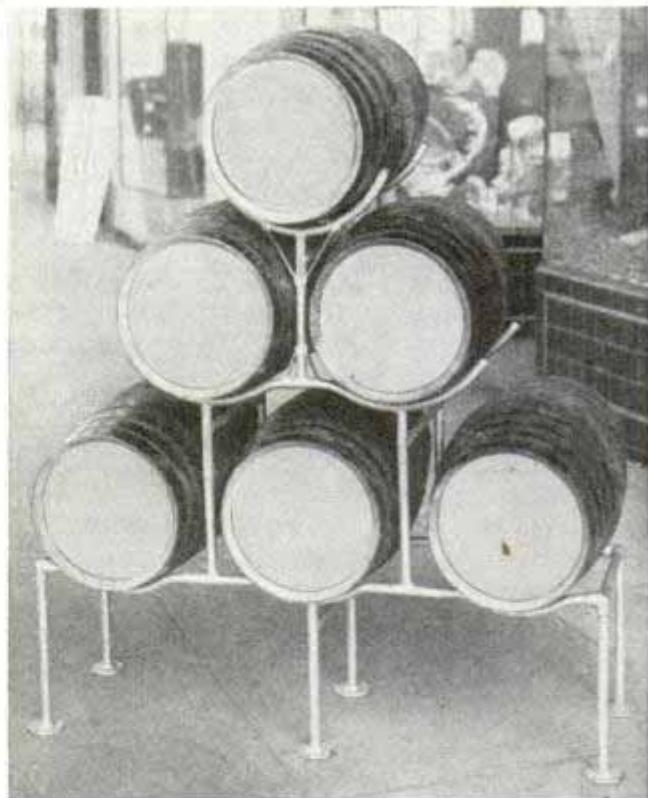
Science is helping Kansas oil producers to dispose of salt water which comes to the surface with the oil, thus solving an old problem and at the same time increasing the flow from producing wells. The brine is pumped back into the ground, either into abandoned oil wells or into special "dry holes" on the edge of producing fields. The work must be done care-

*Conservation Board
 of Health
 U.S. Bureau of Mines*
 fully so that the balance of pressure is not disturbed, causing the salt water to flow into fresh-water streams underground. Brine pumped to the surface with oil is separated from it in special gravity tanks. The removal of oil and brine from the producing formations leaves rock openings filled with gas or water. It is to these openings that the brine must be returned. In many cases, returning the salt water to the earth creates a "water drive" or pressure which forces the flow of oil in producing wells, increasing the daily output. Formerly producers disposed of brine by dumping it into surface streams, causing contamination, or by letting it seep out on the ground, which resulted in many damage suits because of vegetation which the salt water destroyed.

F 1460

**Rack for Barrels Is Made
 of Welded Iron Pipe**

Ordinary plumber's pipe and pipe fittings were used to make a barrel stand for a San Francisco merchant. This rack,

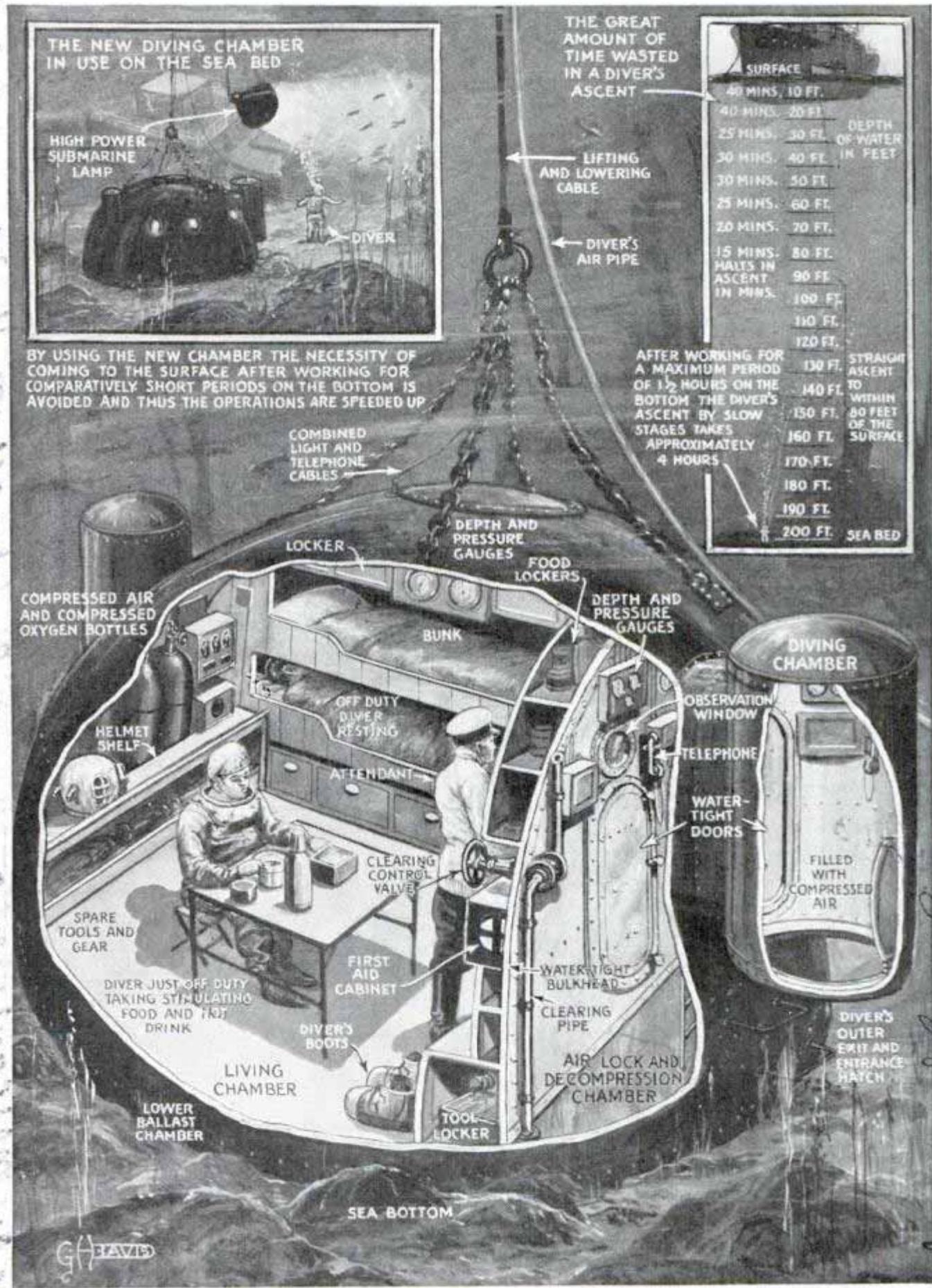


This barrel stand made of welded plumber's pipe is more compact than a wooden rack of same capacity

sturdy and durable, is welded at most of the joints and occupies less space than a wooden barrel stand of the same capacity would require.

*John A. Sanfilippo,
 San Francisco*

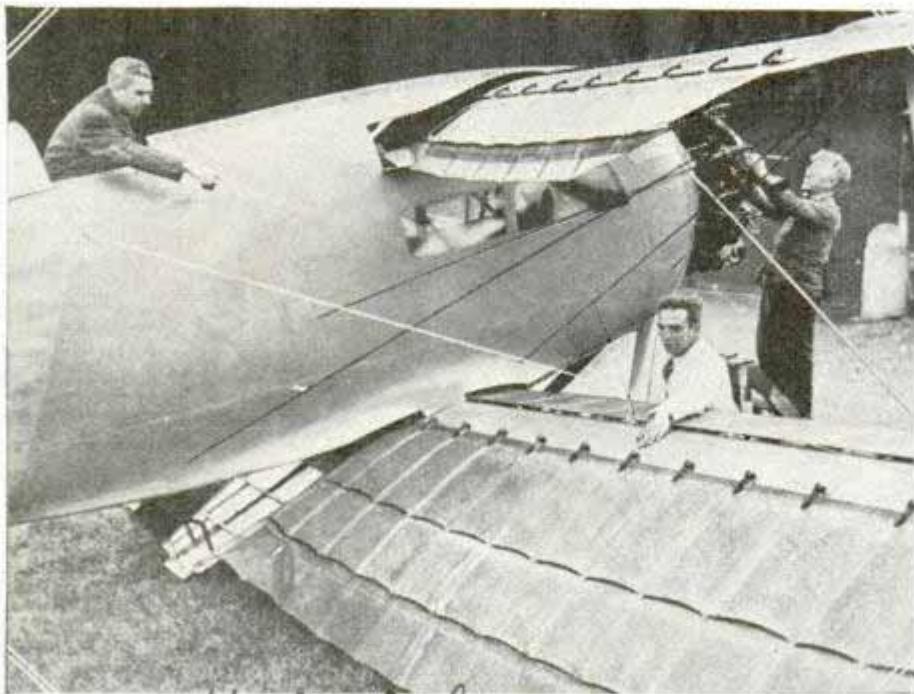
Deep-Sea 'Home' for Divers Speeds Up Work



Designed to speed up operations and to prevent injury to divers through too rapid ascent, this submersible chamber serves as a home for diving crews working on the sea floor. This chamber may remain on bottom until work is completed.

Miss Siebe, Isueman & Co. Ltd.
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F 15 58
Biplane Attains High Speed
by Trimming Wings in Flight



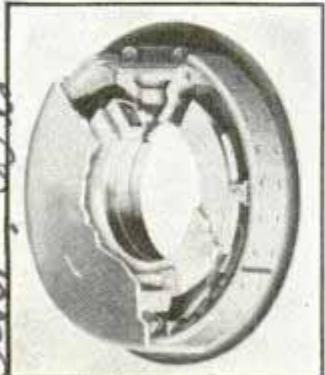
Wide World
After gaining altitude, this biplane can "trim" its wings to one-fourth their normal dimensions and thus increase its speed

To attain top speed, a plane developed by a French aeronautical designer "trims" its wings while in flight. The wing area is actually reduced to one-fourth its normal size for fast travel. The maximum speed is about 187 miles an hour.

F 16 15
**Electric Brakes for Trailers
Operate from Tow Car**

Designed as a simple, effective means of controlling trailers, a new electric brake operates from the storage battery of the tow car at the will of the driver. Only one electric wire connects power car and trailer, and attaching and un-hitching the trailer brakes is as simple as plugging in a light socket.

When the driver pushes down his brake pedal, a simple controller which acts like a rheostat switch permits an electrical impulse to go from the car battery to an



electromagnet in the brake. This magnet, circular in shape, revolves with the wheel. The current energizes the magnet, causing it to cling to an armature disk inside the brake drum. The farther the foot pedal is depressed, the greater amount of current reaching the magnet and the tighter the magnet clings to the armature. This results in the magnet starting to turn with the armature, engaging a cam which expands the brake band against the drum.

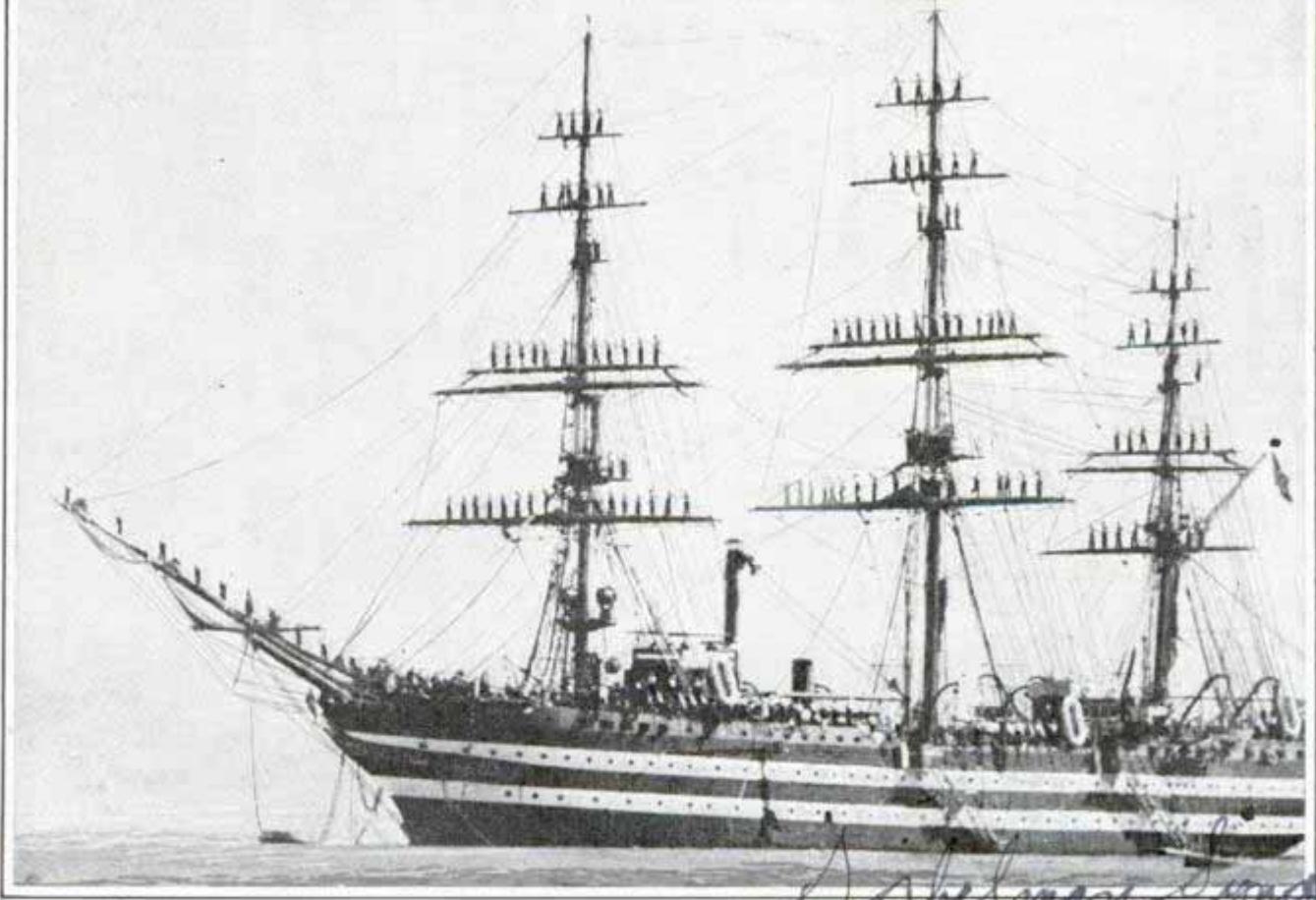
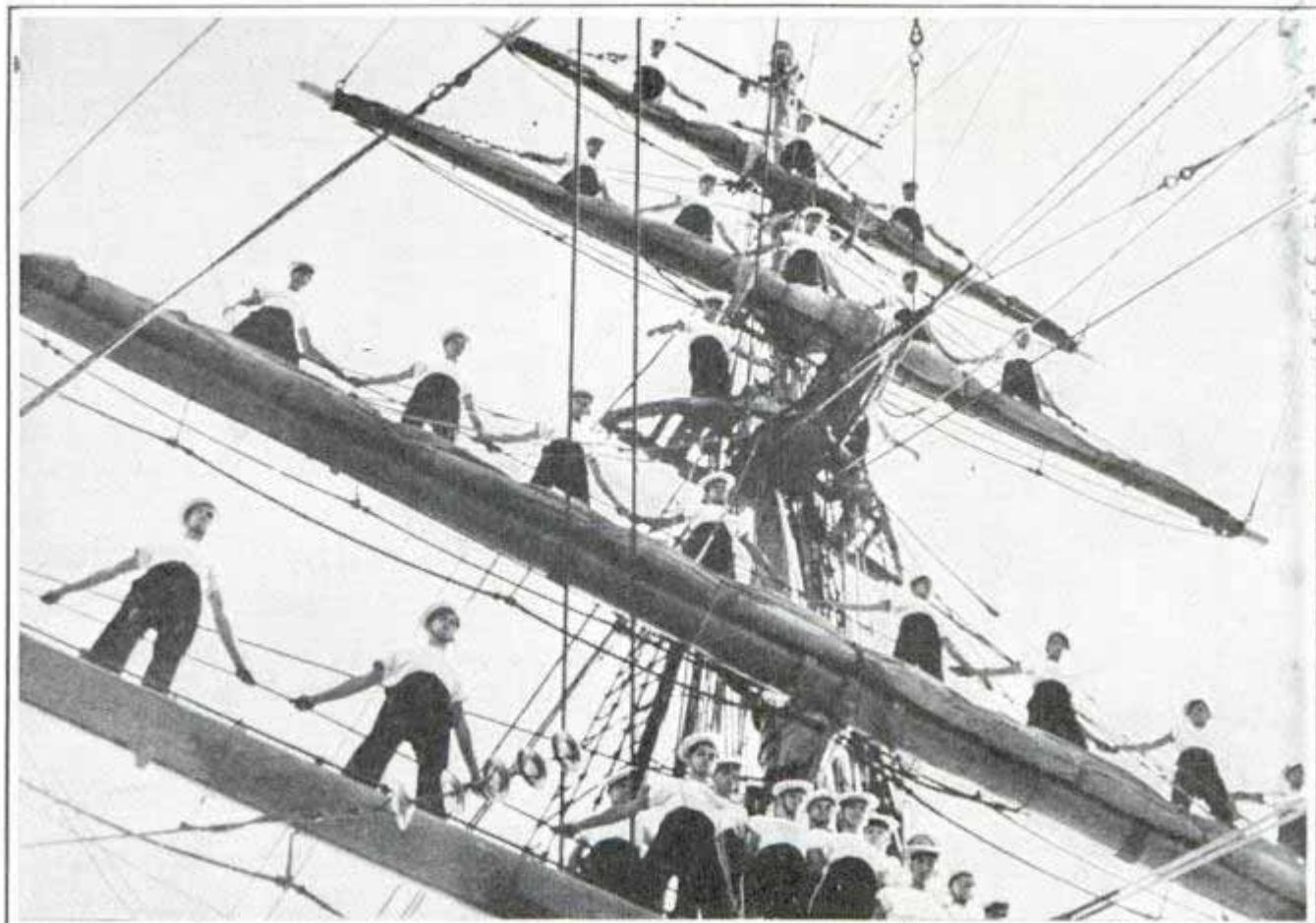
F 16 15
**Electric Outlets
in Handy Stand
Give Safety**

Mounted on a stand, a convenient extension lifts wires off the floor to prevent tangling and provides extra outlets. Placed beside the table, the device offers sockets for plugging several pieces of electrical apparatus. It eliminates the risk of fire which results when makeshift methods are employed to provide additional outlets.



Handy stand provides outlets for plugging in several appliances at once

Old Square-Riggers Help Train Italy's Sailors



Top, young Italian sailors manning the yardarms as they get their first taste of the sea aboard old square-rigged ships. Bottom, every man at his post in the lofty yardarms of training ship.

"Siamese Twin" Guitar Has Double Neck



Orchestra player invented this twin-necked guitar, which requires skill to play

Playing the ordinary guitar was simple enough, so a Massachusetts musician invented something more difficult—a "Siamese twin" guitar. It has only one sounding box, but there are two necks, each of which has eight strings.

F161 Billions Saved on Railroads by Mechanical Progress

Introduction of mechanical advancements and "mass production" practices resembling those of the automobile industry has resulted in a reduction of more than ten billion dollars in the operating costs of American railroads between 1930 and 1935. L. A. Downs, president of the Illinois Central railroad, points out that the lines have even adopted the assembly line method of the auto industry, using it to advantage in repair shops. Other savings, he says, resulted from: new welding processes which have prolonged the life of steel rail one-third, making possible the repair of worn ends without taking up rails and sawing off the worn segments; increasing the standard rail length from thirty-three to thirty-nine feet, reducing

the number of joints at which expensive maintenance was necessary; chemical treatment which has increased average life of ties from six or eight to twenty years; replacing pick and shovel with steam shovels, pile drivers and other machinery; mechanization of track laying, including machinery to drive spikes, and of track surfacing; installation of electric and oil heaters at switch points to keep tracks open during cold weather; increasing the life and efficiency of locomotives by improved methods of water treatment, by raising boiler pressures, installation of automatic stokers, better lubrication and reduction of weight through use of alloys.

F1590 Motor Driven by Contraction of Rubber under Heat

That stretched vulcanized rubber will contract when heated is a little-known fact employed in a rubber-band motor on exhibition in the Franklin Institute, Philadelphia. The device consists of a wire-frame hoop placed about an eccentric hub. Rubber bands are stretched from this hub to the hoop. An electric lamp furnishes heat at one point. When heat is turned on, the rubber band "spokes" contract, exerting a pull on the hub and causing the wheel to rotate. This brings other sets of bands to the point where heat is being applied and the action continues.



Heat of electric lamp, shown behind wheel, keeps this odd rubber-band motor going

Carl Eckhardt

Safe Exhaust Heater Warms Auto Quickly

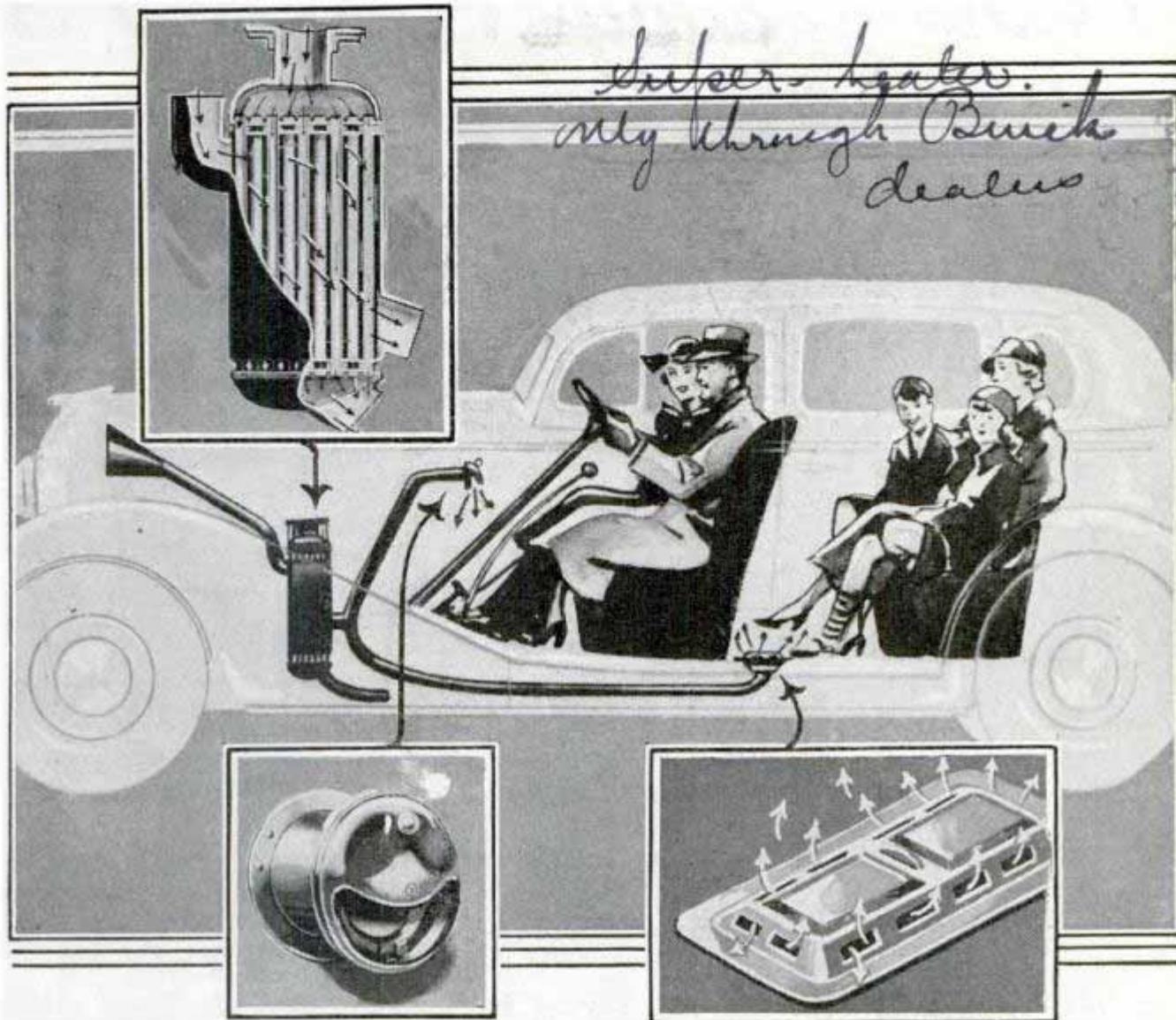


Diagram at center shows how hot air functions. Sketch, top, left, is radiator. Arrow points to its location on engine. Bottom, left, heater control. Right, outlet for warming rear compartment of car

Designed to warm the interior of the car more quickly than other heaters, a hot-air unit now on the market utilizes high temperatures of the exhaust without permitting poisonous fumes to seep into the car. Installed by substituting the heating unit for the complete exhaust pipe from the outlet manifold to the muffler, the heater supplies warm air to registers in the front and rear compartments of the car. The unit consists of a small radiator around which hot air of the exhaust circulates. Fresh air taken in by a funnel located near the front of the hood circulates through the pipes of this radiator, thence to the registers. Thus, the air is heated quickly, being subjected to exhaust temperatures of 600 to 1,000 degrees. A bimetal valve in the heating unit opens

when the exhaust temperature reaches approximately 700 degrees, thus preventing the heater from delivering air too hot for comfort. Pipes in the heating unit are of seamless steel and the surrounding chamber which carries the exhaust is welded to the unit so that failure at any point will not result in leakage of exhaust gas into the car. Noise transmitted from engine through the registers is said to be comparable to that caused by the fan in other heaters. No electricity is required for operation.

Names and addresses of manufacturers and dealers in articles described in this magazine will be furnished by our Bureau of Information upon request accompanied by stamped, self-addressed envelope.

175.00
Cml. Thomas G. Potapenko 10555

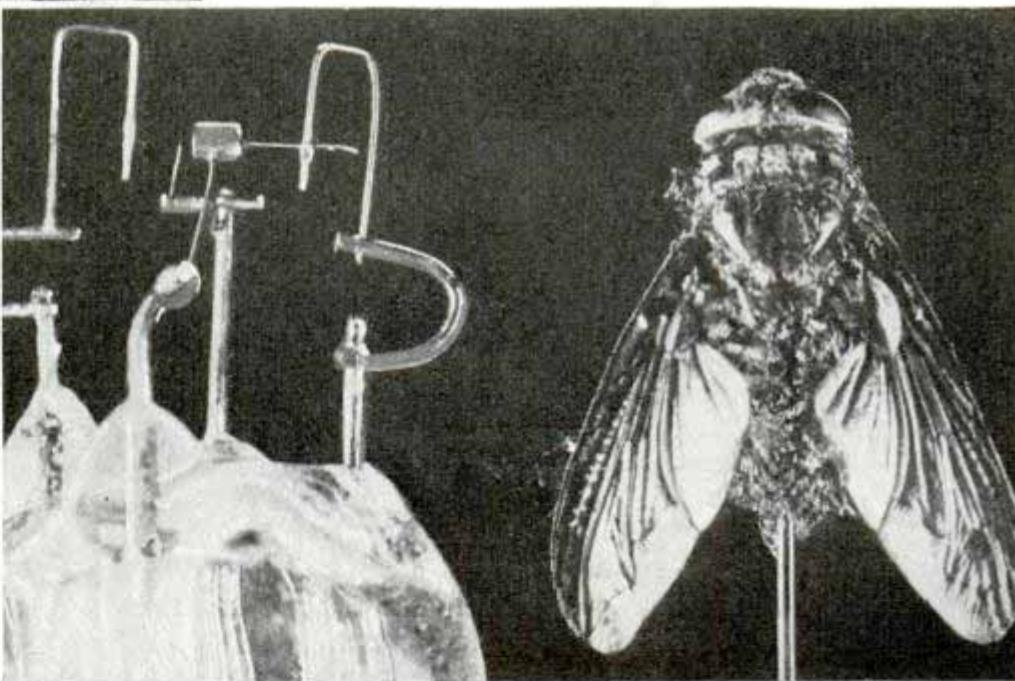
Harnessing RADIO'S



"CENTIMETER" is the latest word in radio. Baby radio waves only a few centimeters long are performing all sorts of strange tasks.

You can harden metals, measure the speed of moving objects or hold secret radio-beam conversations with ultrashort waves. Transmitted automatically from small balloons, the waves can send back reports of weather in the stratosphere. Their therapeutic and bacteria killing properties are greatly extending the possibilities of radio fever. They make possible midget "transceivers" that you can carry in your pocket to talk to other people blocks away.

As a substitute for light the micro-waves



Dr. Potapenko puts unit of five-fingered "tree" tube under magnifying glass. Below, elements of one-centimeter tube compared to horsefly

have an important future. On the sea they can be used as fog-piercing beams to indicate direction and distance of other ships or the shore. In aviation the short waves can be used to "see" through clouds and fog, acting as an altimeter to give heights above ground and also to register miles per hour across the ground.

They are the all-weather airways beacons of the future. They promise to make blind landings safe and simple. Used similarly to a photoelectric cell, high-frequency radio is an effective burglar alarm and can be made to do

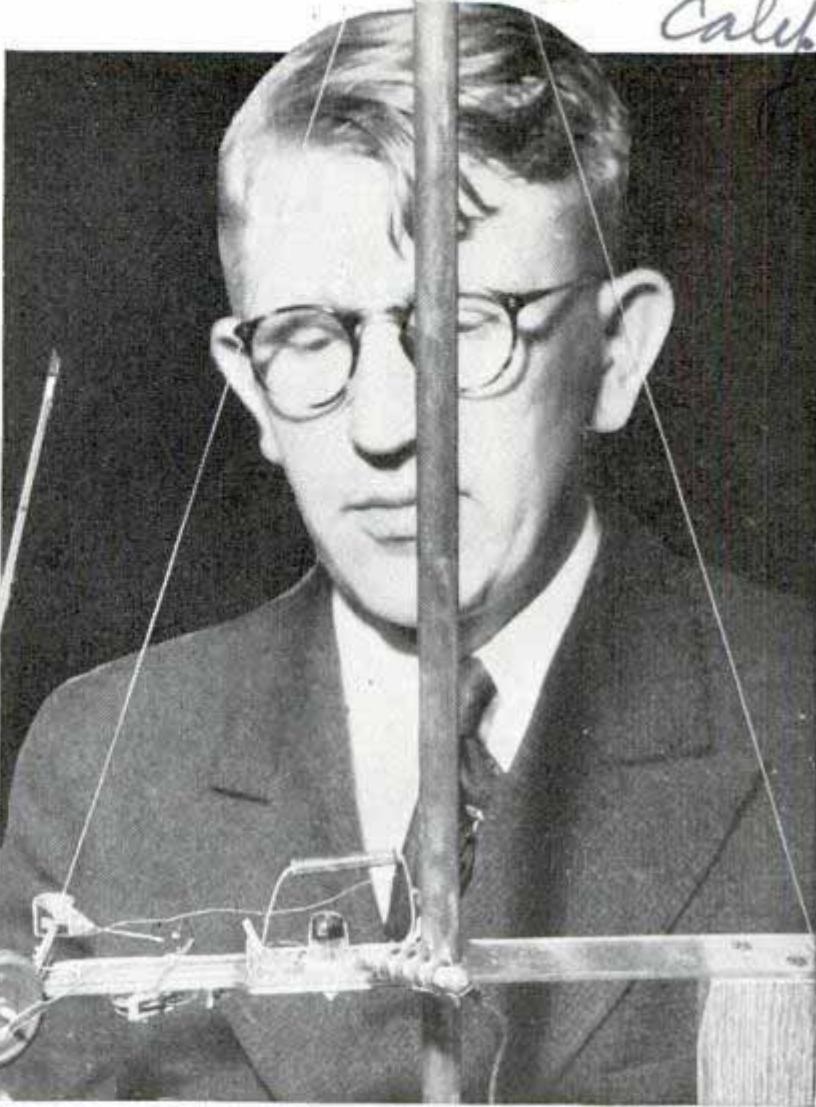
a multitude of special tricks. So far most of the work that has been done has been in ultrashort wave communication. A commercial radiotelephone circuit across the English channel operates on eighteen centimeters, the narrow "line-of-sight" beam assuring virtual secrecy as well as very low operating costs.

A few years ago twenty-meter telephones were looked upon as experiments that could never become reliable. Today

F1530 California Institute of Technology
 "BABY WAVES"
 Pasadena Calif.

they seem old-fashioned compared to the five-meter radio-telephones in common use. Police, amateurs, commercial operators, and experimenters are all working below ten meters. Amateurs have been assigned bands at five meters and at seventy-five centimeters and in addition have the privilege of operating at two and one-half-meter and one and one-quarter-meter wave lengths. There is practically no static from weather sources between seven and three meters.

Until recently it was thought that all radio waves below seven meters in length had the optical property of traveling only in straight lines. For ordinary purposes it was assumed that short-wave communication would be

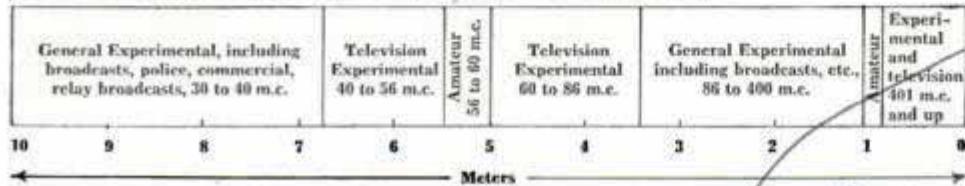


One-pound balloon transmitter which measures stratosphere weather and automatically radios report. Bottom, "transceiver" for communication over short distances, which operates on a wave length of several meters

limited to twenty-five or thirty miles. Beyond that distance the curvature of the earth, buildings, and mountains would prevent reliable reception.

Amateur operators are knocking this theory into a cocked hat. They have worked coast to coast on five meters and at present west-coast amateurs are conducting tests with Australia on five meters. Recently an amateur sitting in

his car on a Los Angeles street used his short-wave mobile set to chatter with another "ham" in Massachusetts. With an input of one watt



Temporary Federal allocations of wave lengths below 10 meters

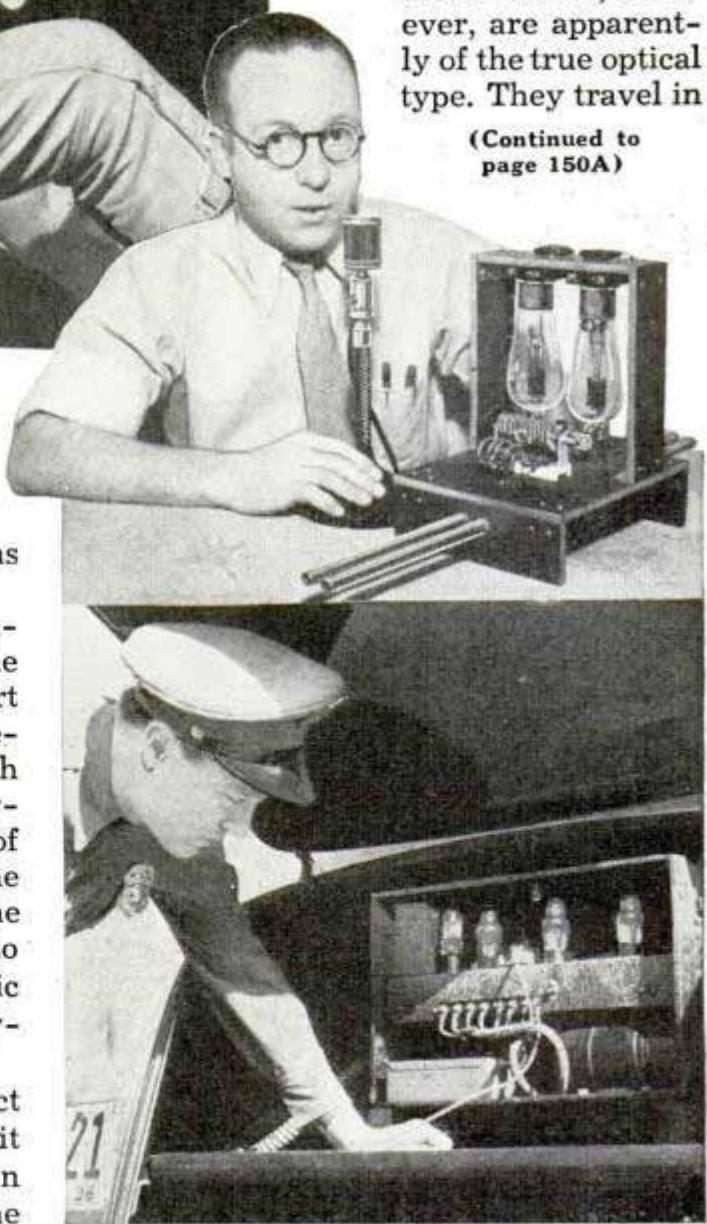
J. Roy August
 1940



of power, he used one-sixtieth of the amount of electricity consumed by an ordinary light globe for a transcontinental conversation. At other times, however, a five-meter transmitter seems unable to reach past the horizon.

Trying to account for these freak conditions has led to the explanation that the Heaviside layer, through which short waves were thought to pass without reflection, is only one of half a dozen such layers in the upper atmosphere. Each layer, it is believed, reflects radio waves of different lengths. The altitudes of the layers, which would affect the range of the short waves, seems to vary from time to time. Apparently temperature, barometric pressure, and even sunspots cause the layers to rise or fall.

The weather seems to have some effect on short waves and on the other hand it may be that radio will become useful in predicting the weather. Amateurs in one community find they can't "work" stations in another town thirty miles away except in foggy weather. In the east five-meter



transmission seems to be best when a cold-air mass is invading the upper air.

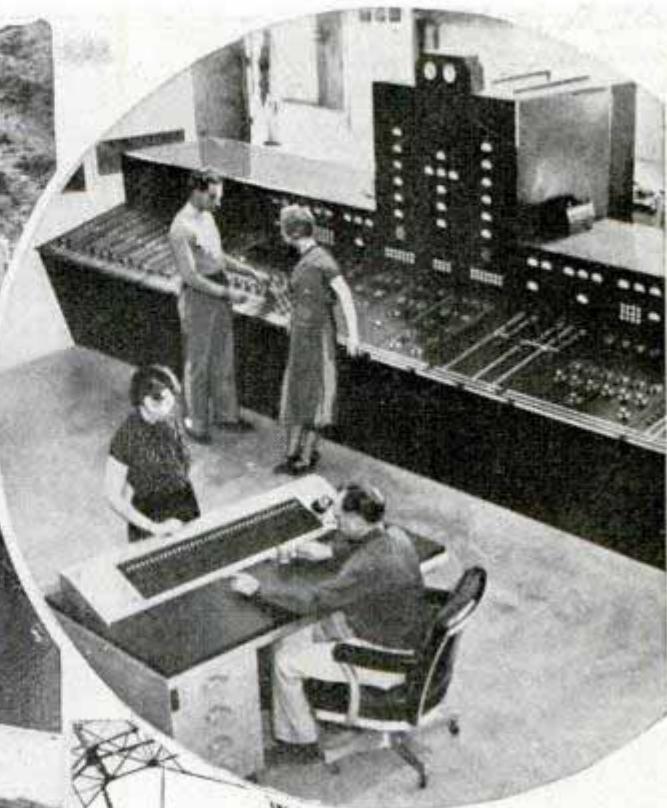
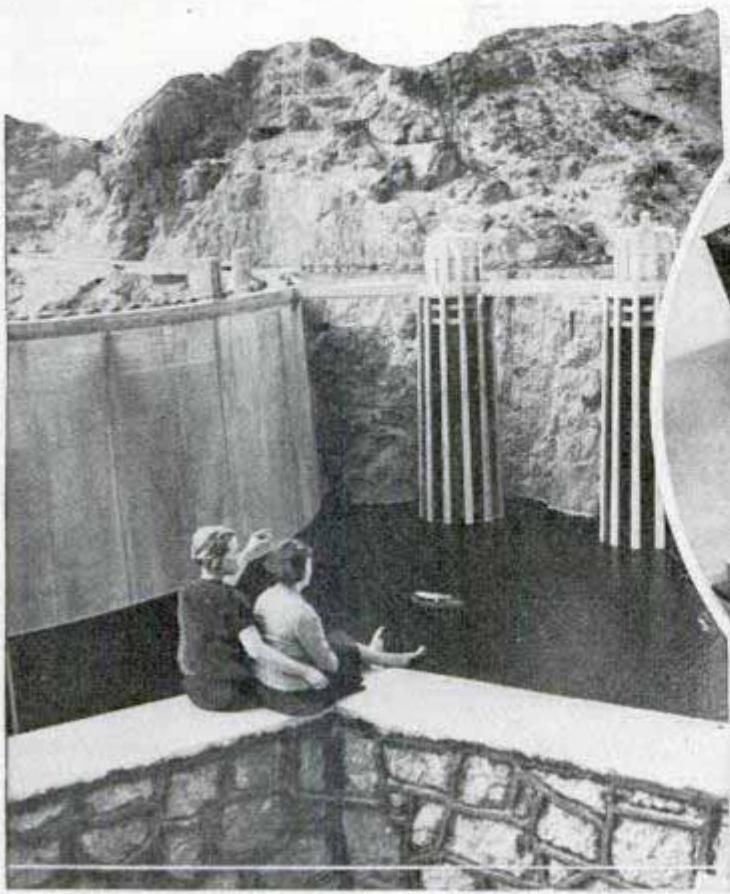
Long-range communication on short wave lengths such as the amateurs have experienced leads to the hope that improvements in tubes and sets eventually may make communication beyond the horizon completely reliable. Naturally these improvements also will extend the range of short-wave television broadcasts.

The ultrashort centimeter waves, however, are apparently of the true optical type. They travel in

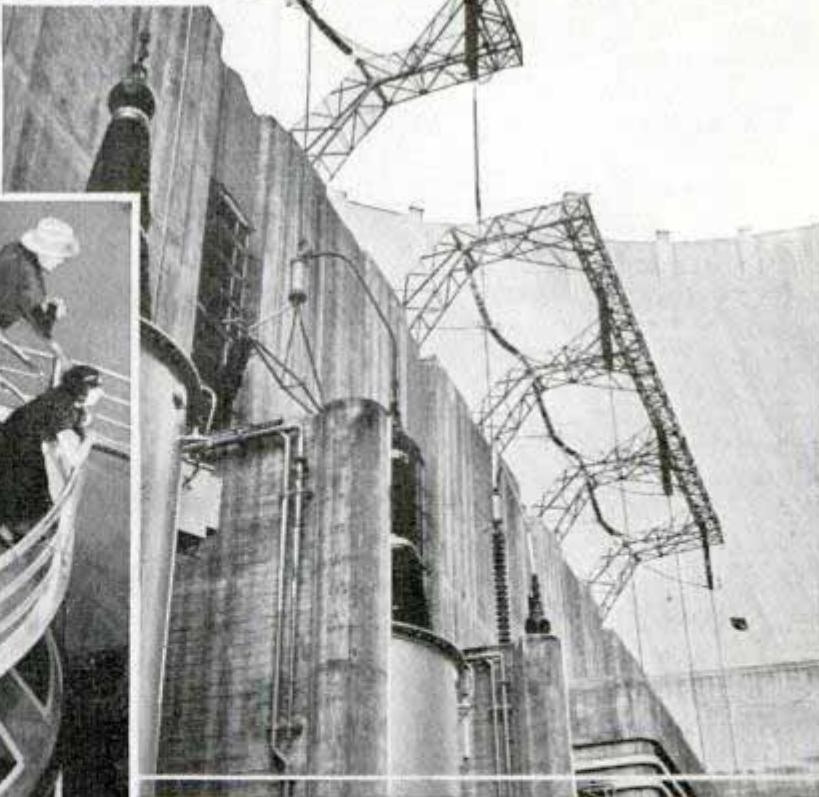
(Continued to page 150A)

Top, police officer using eight-meter set. Center, amateur's transmitter which operates on two and one-half meters. Bottom, eight-meter set in back of police patrol car

Wonders of Boulder Dam Draw Sightseers



Boulder Dam's scenic and mechanical wonders are making the giant power project one of America's biggest attractions for sightseers

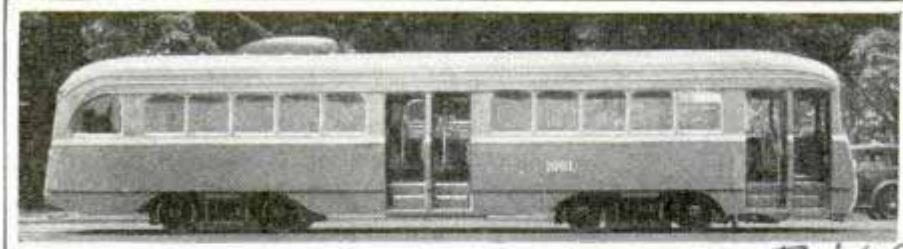


Top, left, observation point with Lake Mead, now 385 feet deep, below. Right, automatic telephone switchboard and powerhouse control board. Bottom, left, looking from exciter platform atop 115,000-horsepower generator. Right, transformers on face of dam handle the flow of power from the big power project through substations to Los Angeles, Calif., 266 miles away.

Wide World Photos

Noiseless Street Car Has 'Dead-Man Control'

Triple braking and the "dead-man control" make the 1937 model street car safe, and rubber sandwiches make it smooth and silent. To help overcome the clang and clatter of the old style car, rubber springs supplant steel in the "trolleys" being built today, and wheels have been redesigned with layers of rubber sandwiched between steel tires and



Three views of 1937 street car. Notice similarity of controls to those of an automobile. Magnetic brakes can be seen between wheels in bottom picture

motors into generators, the momentum of the car "backing up" current and slowing it down. This also generates heat which is applied to warming the car in winter. Second, the magnetic brakes are applied. These are huge magnets close to the track between the wheels, which "grip" the track magnetically. Storage batteries supply current. Finally, the foot pedal applies the conventional air brakes. Acceleration and deceleration have been speeded up to a rate of five miles an hour per second.

wheel proper. Noiseless gears have also been developed. The idea of a dead-man control was borrowed from the railroads. The motorman's left foot rests on a safety pedal which must be kept depressed while the car is in motion. If his foot is withdrawn the car stops. The new street car is driven entirely by foot. At the center is a control pedal governing speed, operated just as you drive your car by pressing the accelerator. At the right is the brake pedal, actuating three separate brakes; first, the dynamic brake, which converts the

F 1666 Bird-Proof Windshield Is Sought to Protect Airplane Pilots

Finding how to build an airplane windshield that can survive the terrific shock of collision with a bird has given the National Bureau of Standards a tough problem. Putting that material to test is still another problem. Engineers are seeking a transparent plastic that would protect the pilot from the danger of a bird smashing through the windshield. Cellulose acetate is one of several materials being tried. If

Dr. G. M. Kline.

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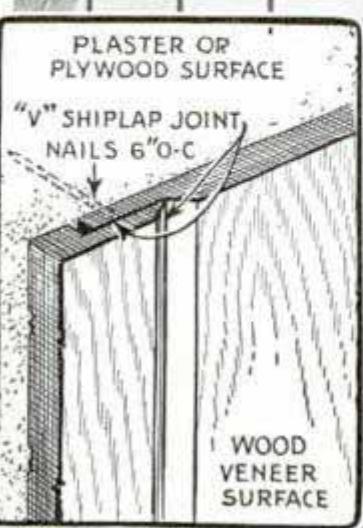
the combined speed of plane and bird is 270 miles an hour and the bird weighs four pounds. 10,000 foot-pounds of energy are involved in the impact, and this must be simulated in testing. At present tests are being made by firing a rubber projectile from an air gun against the windshields.

T1539

Wood Veneer Wallboard Is Aid to Builders

Expensive wood finishes for interior of home or office have been brought within reach of the average family or builder by a new product which consists of fine cabinet wood veneer applied to a Celotex base. The material, supplied in walnut, mahogany and avodire, comes in pieces six or nine inches wide and eight or ten feet long. It is easily applied over old walls or in new construction without special treatment. Because of a patented joint, no nails are visible after installation. The veneer may be painted, first being coated with clear shellac and then with flat varnish. The wood finish is only one-quarter inch thick, therefore it is particularly suited to modernization work.

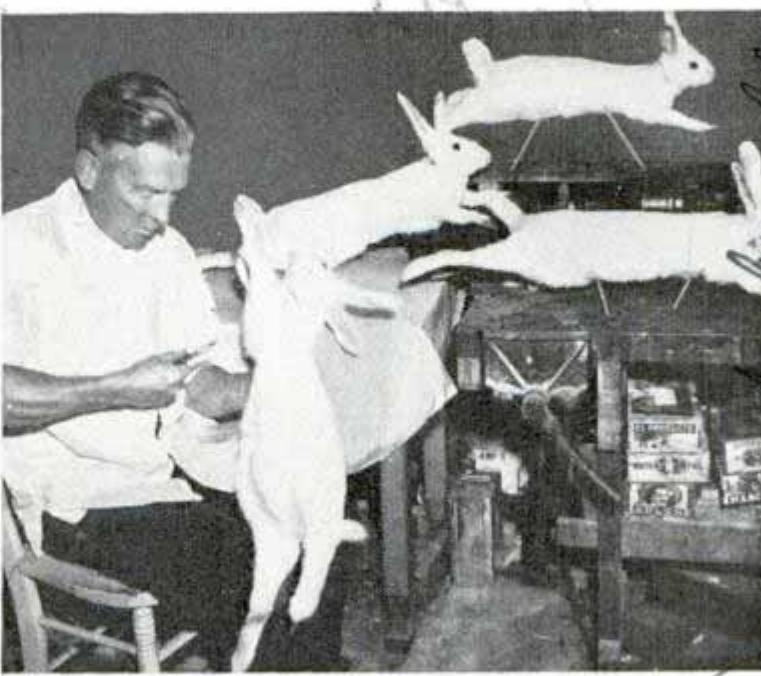
CX Texhara



Wood veneered wallboard in room. Inset, how the wallboard is applied

The Celotex Corp.

Big White Decoy Rabbits Easy for Racing Dogs to See



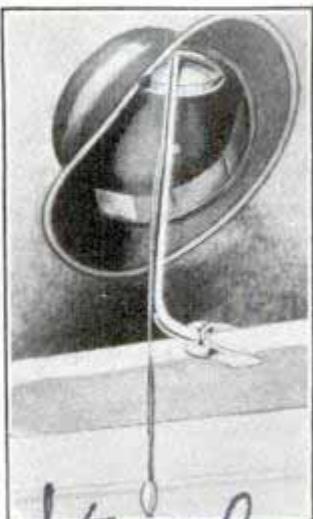
Shop in which big white rabbits are manufactured for dog racing tracks. The color makes them easy for dogs to see

While watching a dog race several years ago, a New Jersey taxidermist noticed that the hounds became confused because they could not see the decoy rabbit. Racing dogs depend entirely on sight, not on scent, so the taxidermist mounted a big white rabbit in lifelike posture and tried it out on the track. The results were so good that he now supplies most of the decoys for American tracks. The rabbits are mounted with heavy wire at front and back for attachment to the track motor.

T1624

Hat Rack for Top Shelves Is Lowered by Cord

Made in models for attaching to top shelves, wall or door of clothes closets, a handy hat rack introduced recently has a cord by which the hat may be lowered within reach. The round top of the holder is roughened to prevent the hat from slipping off.

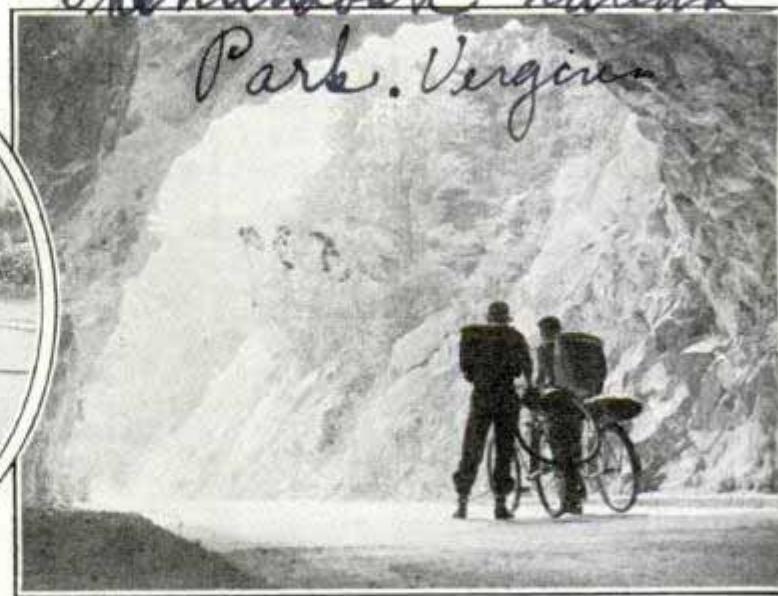
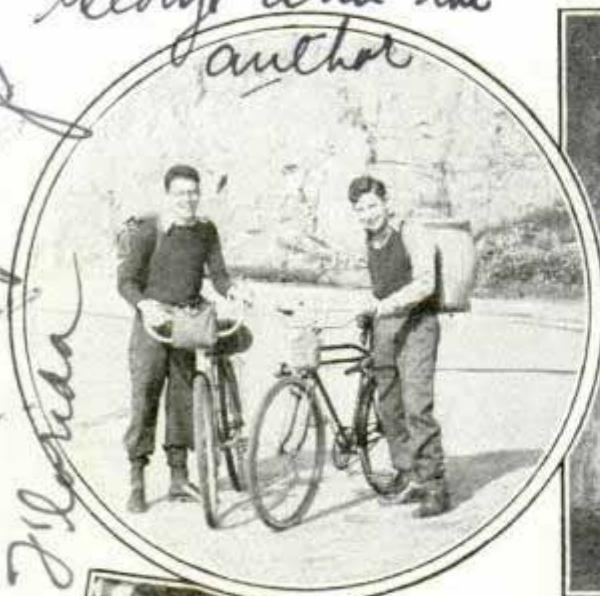


The Stanley Works 195 Lake

1563 3870

Thirteen-Hundred-Mile 'Bike' Tour Costs \$22

George and the author
George and the Shenandoah halina



Top, the start of a seven-week bicycle tour and a pause to enjoy scenery from mouth of a tunnel in Virginia. Below, breakfast after a night in the open. The roadside warning didn't stop the boys

Twenty-two dollars for a seven-week trip is a bargain price for all-expense tours in this country. That is exactly what it cost each of two boys for a sight-seeing bicycle tour from New York to Florida. At the end of a journey that took them through Washington, D. C., the Shenandoah valley of Virginia, the Blue Ridge mountains and the Carolinas, the cyclometer showed they had pedaled 1,367 miles. There were no punctures in all those miles, but the boys did have to buy one new front wheel after a collision. The twenty-two dollar expense account included this wheel and tire, a supply of camera film, food and equipment. The boys camped in the open and cooked their

own meals except when hospitality was offered along the way. They carried bedrolls and twenty-five pound packs containing an aluminum cooking set, small stove, food bags, extra clothing, toilet kits, canteen, flashlights, folding candle lantern, cameras, first-aid kit and repair outfit.

1663 June 206 3870

Sound Track on Paper Invented for Newspaper Supplement

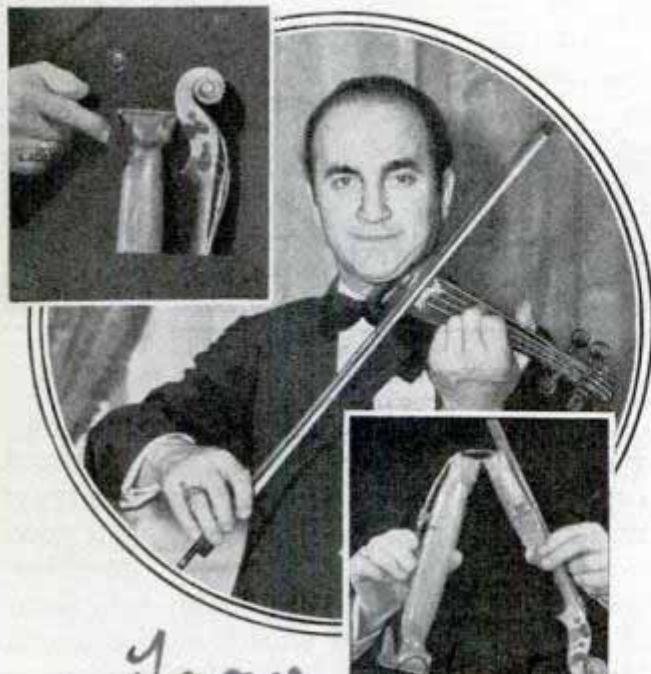
Comic strips and feature sections may soon be accompanied by sound records distributed as newspaper supplements. A patent has been issued for a method of impressing a sound track on a circular record made of printers' mat paper. The

record, delivered with your newspaper, could be "played" on an ordinary phonograph with a blunt stylus. Although ordinarily the record would be played only once or twice it would endure several repetitions.

F1576
**Collapsible Violin
Can Be Carried
in Pocket**

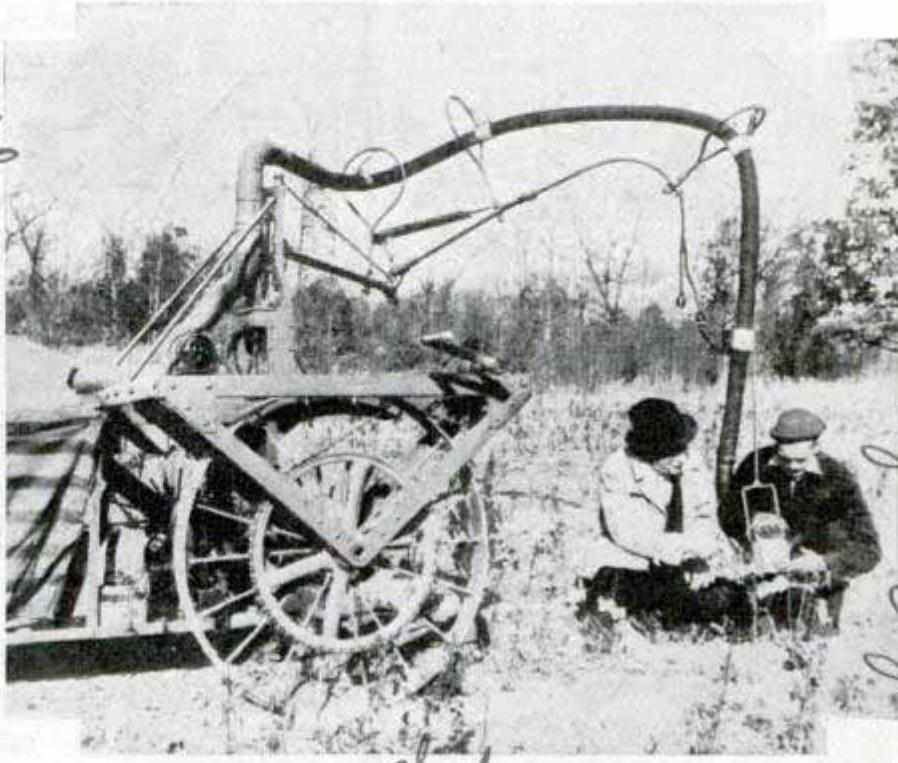
Dave Rubinoff, the noted violinist, likes fishing almost as much as he likes music but disliked the excess baggage of a violin on a fishing trip. He solved the problem of going fishing and still being able to practice on his violin by taking along a collapsible instrument which folds so it fits in a small case or even in his pocket when not in use.

It is of regulation length and the keyboard is standard size but it does not possess the width of the ordinary instrument. This is an advantage since the tones are so soft that the user can practice in a hotel room or Pullman car without disturbing others.



F1576
Taylor
*Folding violin which fits in pocket. It is of standard
length but not as wide as ordinary instrument*

Cotton Picker Twice as Fast on Job as Human Worker



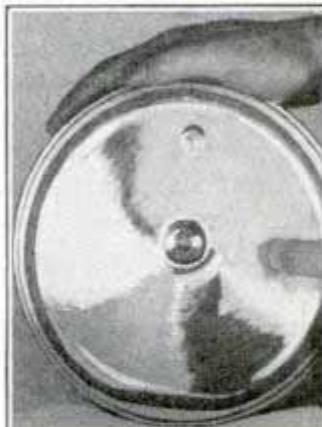
Demonstrating simplified cotton picker, which is claimed to be economical in operation. Its construction costs also are low

Twice as fast as a human worker, the latest cotton picker cleans the bolls well. It is said to be simpler to operate and less expensive than previous machines designed for the same purpose.

F1619

Auto Lamp Reflectors Cleaned by Fluid Polish

For maximum efficiency and safety, reflectors in automobile headlights should be kept clean. A special reflector polish is now available. Applied on a small piece of cotton, it is allowed to dry and is then wiped off, taking the dirt and rust with it. It is a harmless fluid and cannot scratch the polished surface. Rubbing the reflector briskly with a soft cloth after removing the cleaner produces a high polish.



1501 Broadway

Winchester Prod

DATING UP the



THIRTY years ago.

Arabs taught Americans how to grow dates. Today, America is teaching the world.

So say the palm culture specialists who brought the date from its cradle in the Sahara and nursed it to supremacy on the great American desert. The Arabs were world champion date growers

4,000 years before Christ; cowboys didn't start until nearly 1,900 years after.

America conceived the idea of a home-made date in 1890 as a possible cure for an agricultural problem child. In the southwest was a tract of some 68,000 square miles devoted to the production of sandstorms and horned toads. Soil and climatic conditions of the Colorado desert



Truck carrying tower for inspecting date palms for scale and, above, the tower extended and two inspectors at work

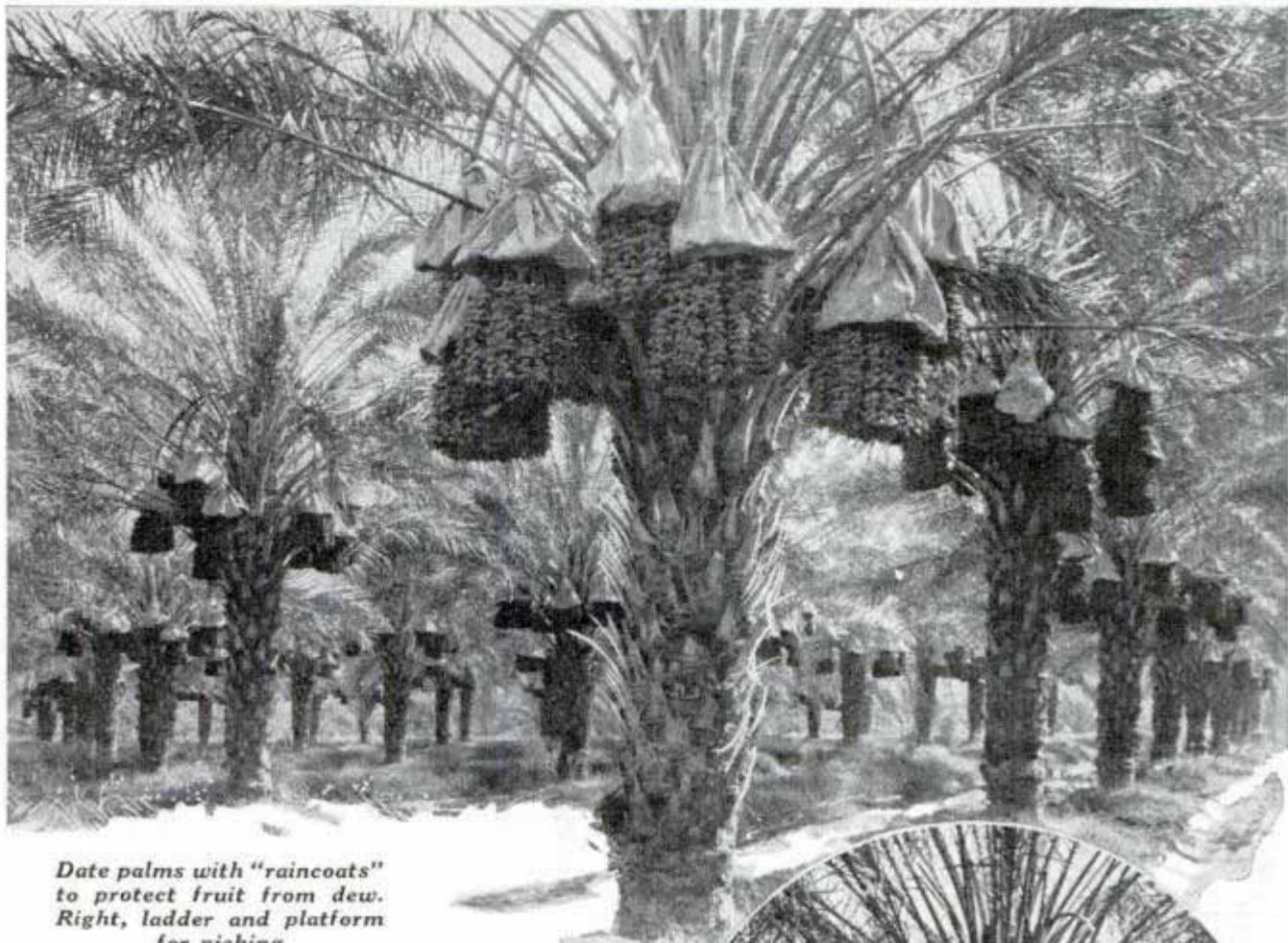
were similar to those of the Sahara. The land was as fertile as the Nile delta—natural date land—and had been tested to a depth of 1,800 feet without hitting the bottom of the silt.

Other palms were growing on the Colorado desert—palms older than history that came from nobody knew where. True, they were barren palms. But, reasoned horticulturists, where a fruitless tree would thrive, a potent palm should bear fruit. An order was cabled to Egypt for date palms but all we got out of that experiment was a wholesome lesson.

A foreign merchant filled the order. More than half of the shipment were male trees. Inasmuch as one male palm will serve a harem of thirty to thirty-five females, he apparently imposed on American innocence, then compounded the imposition by shipping seedlings instead of born

trees. There's a vast difference. About one seedling in 100,000 grows true to type; and for every seedling producing a good new variety, there are 10,000 worthless trees. A seedling female palm may bear the best date in the world, or the worst. Its fruit may throw back 10,000 years to the great-grandma of all its particular kind. It may refuse to yield and, if it does

AMERICAN DESERT



Date palms with "raincoats" to protect fruit from dew. Right, ladder and platform for picking

bear, the odds are 900 to one it will produce something unfit to eat.

It took Uncle Sam ten years to discover something was wrong with his 1890 purchase of baby palms. The trees grew at the prodigious rate of two feet a year; but mostly they were barren, and fruit of the producers was inferior. Dr. David Fairchild went to the Sahara as America's trouble-shooter. He sent home the first shipments of fertile offshoots in 1901, but had to obtain the intervention of the British governor-general of Egypt before he could buy even one date sprig. An Arab may sell his wife—or one of them—his camel or his donkey. But try to buy an offshoot from a choice palm and he reaches for his trusty scimitar. Nor will he dispose of his best fruit unless there is a surplus over family needs. His garden is protected by a high stone wall, and admittance is only by invitation.

Dr. Fairchild returned with enthusiastic reports of a rare date he found in bazaars



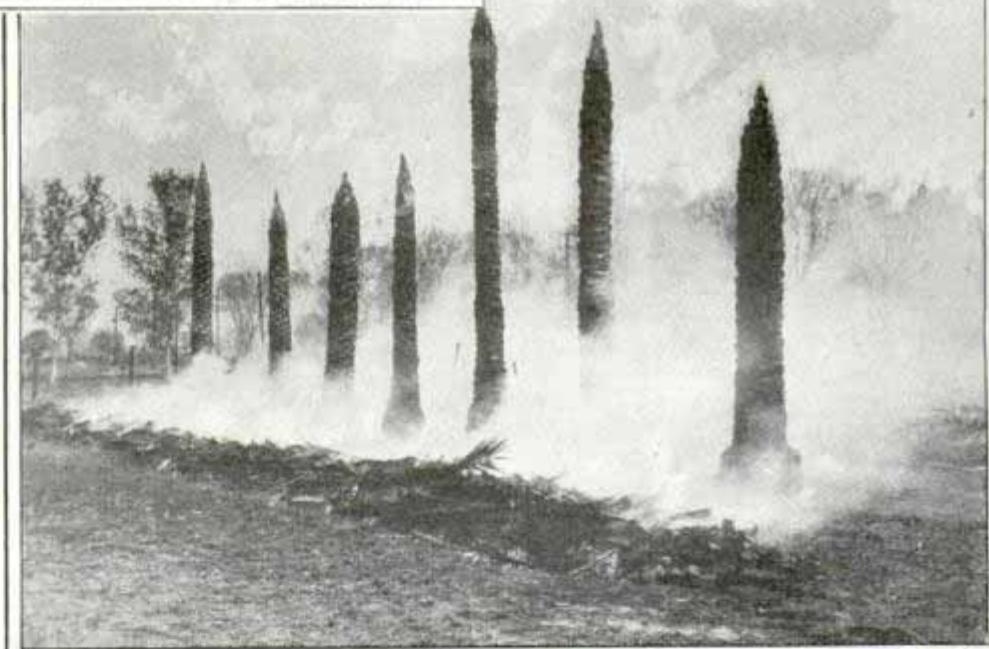


along the Nile. It was called the wahi, and he traveled thousands of miles by camel trying to trace its source and buy some of its progeny. Other government agents also attempted to trail the wahi without success, until Dr. Silas C. Mason was sent to Egypt in 1913 with instructions to bring home a wahi date child, and bring her home alive. He sent bundles of thousands. A sheik told him the secret.

"We of the oases call it Saidi or Saideh," he said. "But when these Bedouin traders get over to the valley with it, they call it the wahi. A wahi date is a date from an oasis—any date from any oasis."

A true-to-type palm daughter springs from the body of the mother tree and is nourished by her for the first three to four years of life. When the child has sprouted roots and weighs about fifty pounds, it is taken from mamma. If mother is a good producer, her child is planted to grow up in her own image and with all her virtues. But if she isn't, her children are condemned to the flames, and all her line is doomed to die with her.

A robust female palm produces ten to twenty daughters, worth from \$20 to



Date palms pruned and "torched" to kill insects. Above, "raincoats" to keep off the dew serve also as sun screens and shields from insects

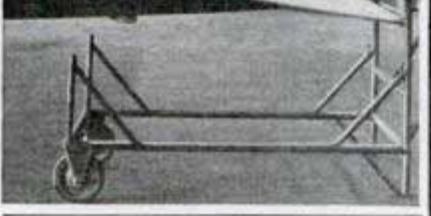
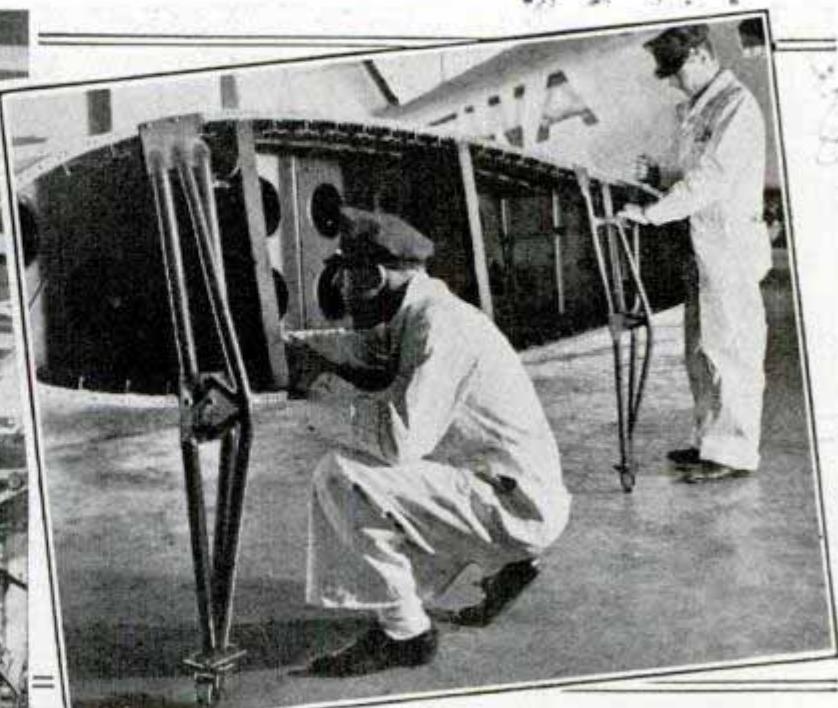
good for a paying crop up to 500. Until now, she has successfully resisted efforts to induce her to continue bearing daughters after about twenty years. In rare instances, offshoots have been coaxed out by intensive irrigation but they are not so husky as the first-born. Offshoots from high up on the trunk are preferred stock, always true to type, and likely to be heavy producers of exceptionally fine fruit. Male palms bear their sons in the same manner as daughters are born to the female tree.

It was probably nature's plan to produce about an equal number of male and female palms, relying upon the wind and

(Continued to page 134A)

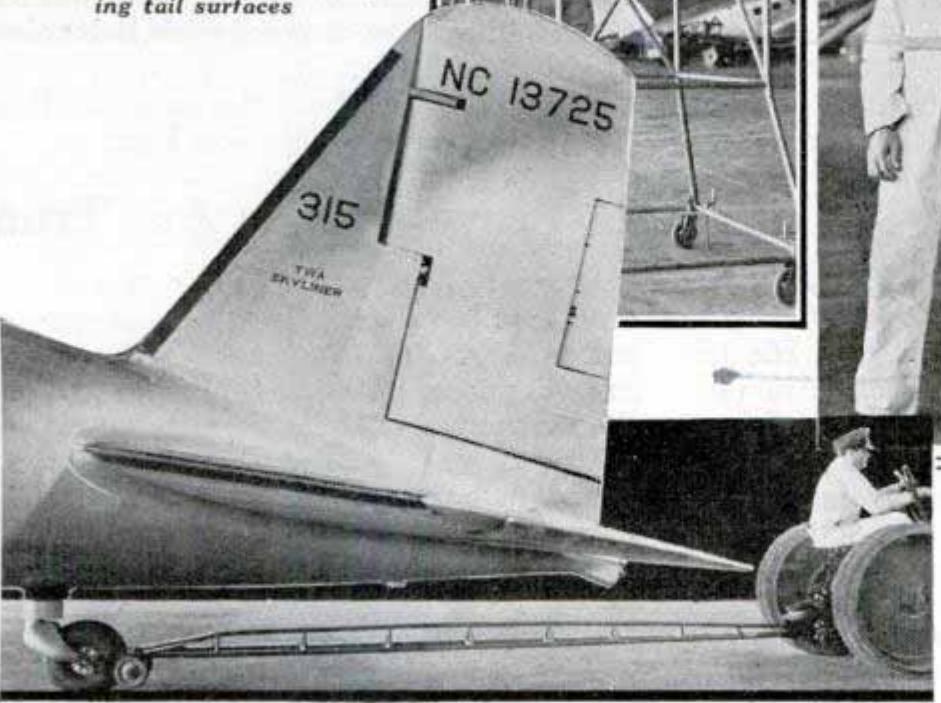
\$2,000 apiece, values depending on maternal variety, quality and productivity. The tree starts to reproduce five to eight years after weaning and being started on her own. She gives up motherhood at the age of twelve to twenty years, then settles down to food production at the rate of 100 to 500 pounds a year. She is in her prime as a fruit producer at 100 years, and is

Handy Stands Speed Servicing of Air Liners



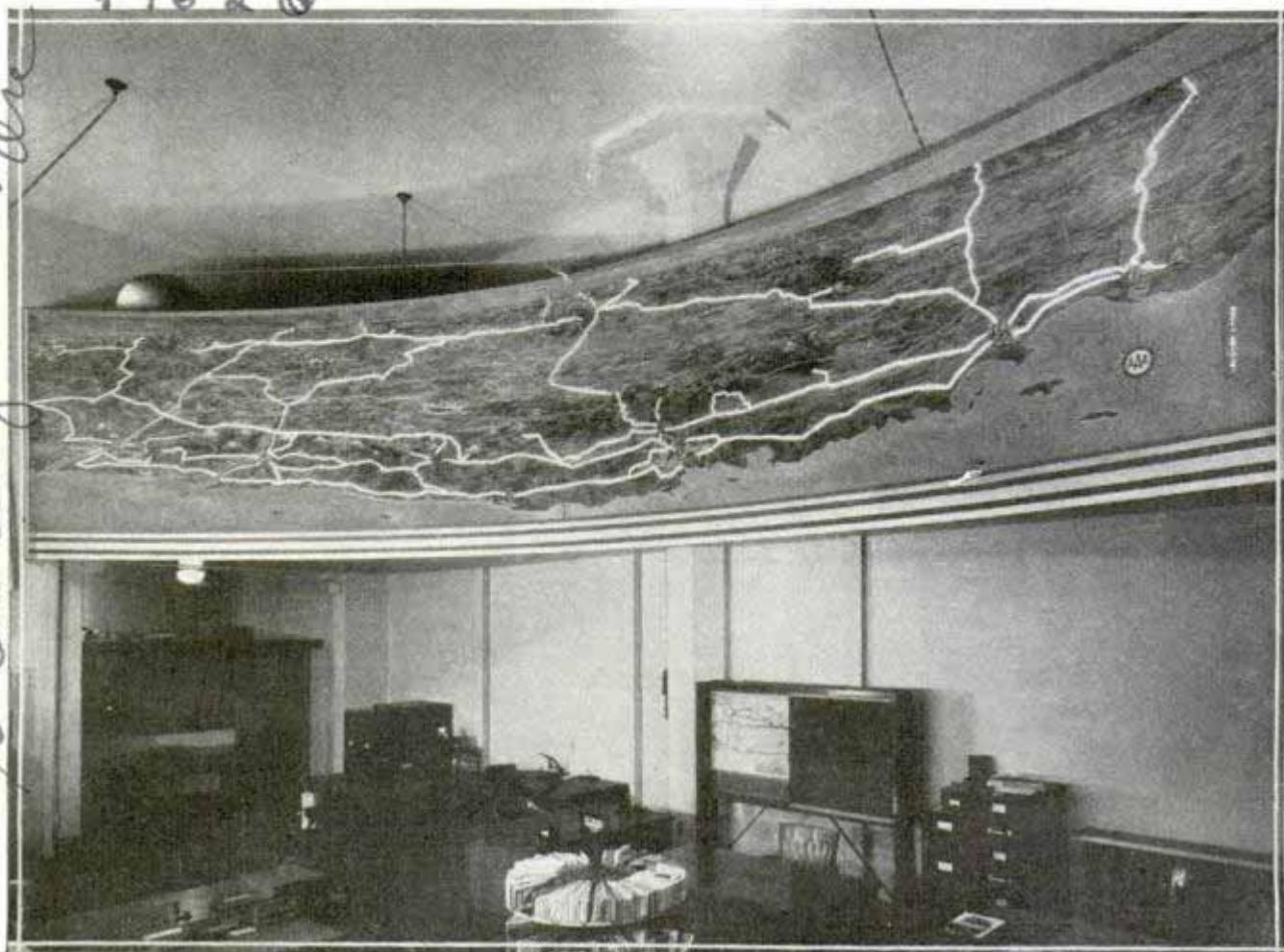
Unusual stands which facilitate servicing of Transcontinental & Western Air skyliners. Above, stand on casters speeds work on wing panels

Above, stand used for work on rudder. For tail inspection a padded part rests on stabilizer. It can be placed at footing desired without interfering with tail surfaces. Below, steel frame for towing skyliner permits tractor to turn without bumping tail surfaces



Center, working on nose of air liner is made easier by stand providing eighteen square feet of space. Right, platform which fits landing-gear structure provides footing for mechanic to do work inside nacelle

Illuminated Map Shows Routes for Tourists



Sections of highways or entire routes can be lighted on this map by operating a control board. The map shows the tourist at a glance the best route for any trip in the Pacific region.

Major highway routes of the Pacific coast and Rocky mountain areas may be pictured for tourists on a huge illuminated mural map installed in the office of the Oregon State Motor association at Portland. Controls at a central switchbox provide for illumination of any major section of highway, or an entire trip over various

routes, each being lighted in a different color. The map offers a perspective view of the entire Pacific coast, from British Columbia to Mexico, extending inland as far as Yellowstone National park, Salt Lake City and Santa Fe. Thirty-eight hundred electric bulbs illuminate the map, which is forty feet long and eight feet high.

Film Expert Digs in History to Prove Movies Are True

Fine points and odd facts in history are dug out for motion pictures by Harold Hendee, RKO research director. His job is to make everything authentic in pictures, although after he has approved facts for use in a film, the studio may make a change for box-office purposes. These changes, however, are said to be infrequent. Among the oddities he has been asked to determine are: was "cop" used for policeman in 1840; when was "going on a bender" used in the modern sense, and when was "doughboy" first used in the

language? The research director discovered that "cop" was not a part of speech before 1859, therefore it could not be used in a film dated in 1840. Doughboy was in the vernacular in 1685, when it designated a British sailor's cake, then later it referred to brass buttons on infantry uniforms and finally, in the Civil War, to soldiers. In 1862 the people first began talking about "going on a bender" with the modern implication. Once in a Revolutionary picture, the film used a flag of the colonies instead of the American flag. Many movie

Cont. Miss O'Getty

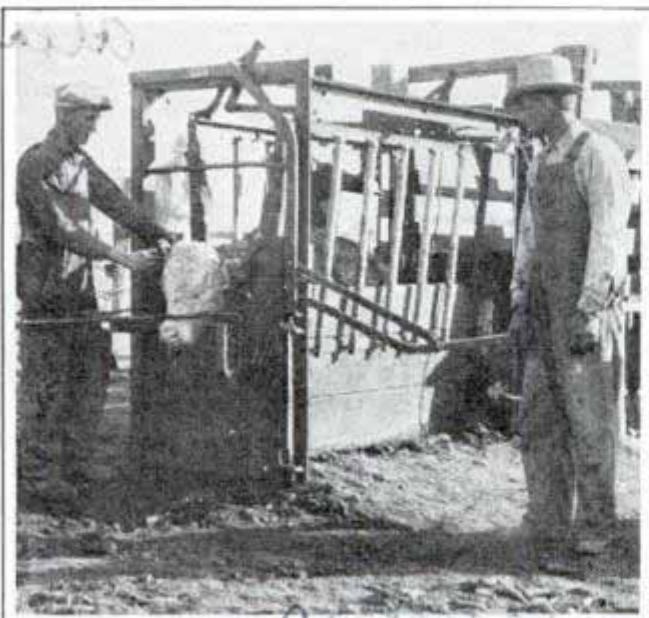
E. Stine

fans protested, referring to the famous painting of Washington crossing the Delaware, which shows the American flag. Mr. Hendee points out that the American flag was not designed until seven months later than that incident in history, so the film was authentic. Once in checking the weather during a battle in the Valley Forge campaign, he found two historians recorded sunshine, but four others declared the men fought in a snowstorm. The studio used the picturesque snowstorm.

F1626

Old West Goes Modern in Handling Cattle

Handling cattle with special mechanical aids is robbing the old west of some of its glamour, but is introducing efficiency. On the Stanley ranch near Phoenix, Ariz., four operations are performed at one time: dehorning, spraying the cattle's ears to kill ticks, branding and injecting a serum against "black leg." This work is done with the aid of a special cattle chute, the sides of which are operated by a lever to hold the cattle firmly. Only one and one-half minutes is necessary for the whole job and hundreds of cattle are handled daily.



Latest method of handling cattle

Glass Screen for Fireplace

Allows Clear View of Blaze



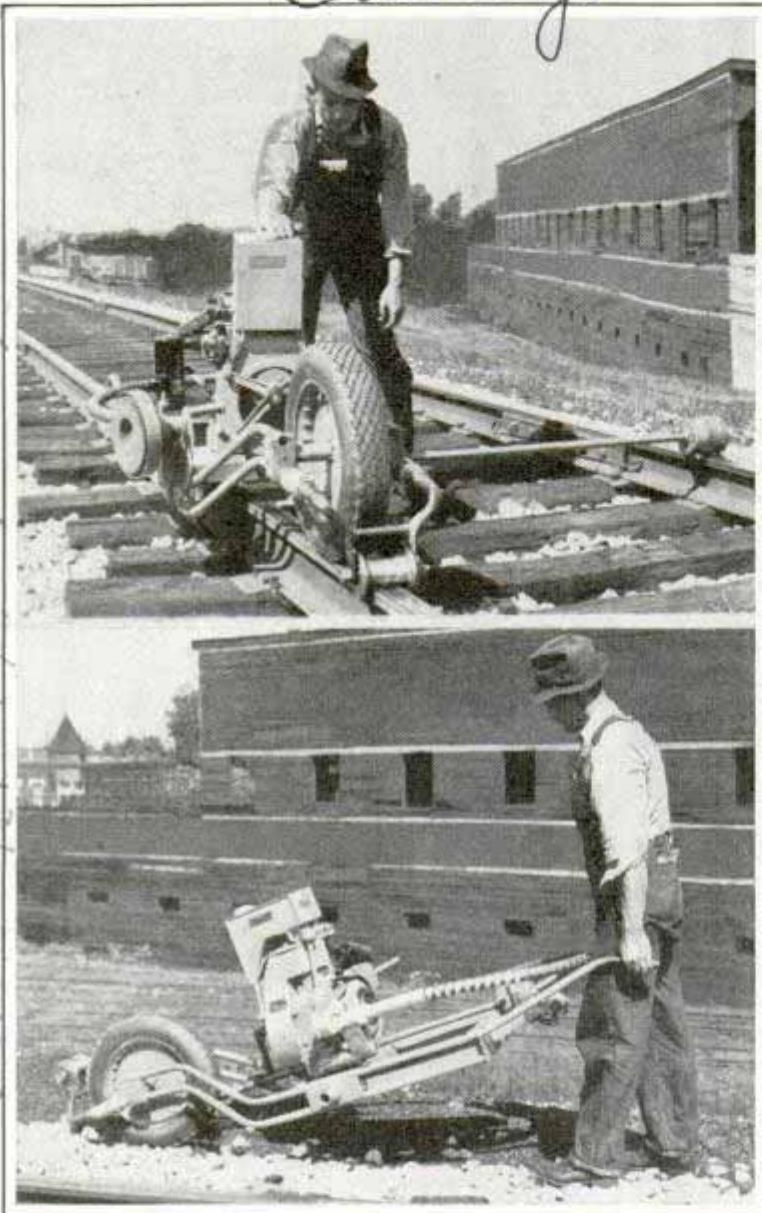
Glass screen fits into modern decorative scheme and does not obscure view of the fireplace. Design can be etched in glass

In keeping with modern decorative trends, a glass fireplace screen has been introduced. It adds charm by permitting an unobstructed view of the dancing flames. Made of tempered glass, it is strong enough to withstand heavy impacts and gives full protection from flying sparks. These glass screens are made in various styles and are decorated by sandblasting designs or monograms. Colored glass could be used to match room decorations.

Popular Mechanics Magazine does not publish the name of the maker of, or dealer in, any device described in its pages, but this information is kept on file and will be furnished by our Bureau of Information upon request, accompanied by stamped, self-addressed envelope.

*Leibey-Gervin Old glass Co
Dry and solid
W arman and
Gervin Old glass Co*

7740 South Chicago Ave 2206 South Road.
 One-Man Grinder Speeds Up Railway Maintenance Chicago



Top, pushing rail grinder along. Bottom, rolling the machine beside tracks. The grinder is handled easily by one man

Designed for one-man operation, an all-purpose rail grinder which may be moved along on the tracks speeds up maintenance. It is useful for reconditioning battered rail ends, frogs, crossings, switches, slotting joints, removing excess metal from rail ends, stock rails and switch points and for general work. A pneumatic-tired wheel permits moving it along the right of way.

185 "Block Signal" Operated by Auto Slows Traffic on Curves

Automatic traffic lights which are operated by the automobile itself as it passes

over a sound box have been developed by a Baltimore inventor in an effort to make highway curves safer. The hollow sound box was placed in the roadway about 100 feet from a sharp curve and warning lights were installed directly over the curve. Normally, these lights remain red. But if a car passes over the sound box and continues toward the curve at fifteen miles an hour, the light changes to amber just as the car reaches the turn. If the motorist drives faster, however, the light will still be red and he must stop. If the car was driven on the left side of the road and missed the sound box the light would stay red until another car caused it to change. A similar installation of lights to the left of the road warns the motorist of a car coming from the opposite direction.

F162+

Bird's Broken Leg Mended with Tiny Splints

Major operations are performed in an odd hospital whose only patients are birds. Recently a canary with a broken leg was treated by the skilled bird doctor, a woman, who fashioned tiny splints to hold the fractured parts in place while the patient was convalescing.

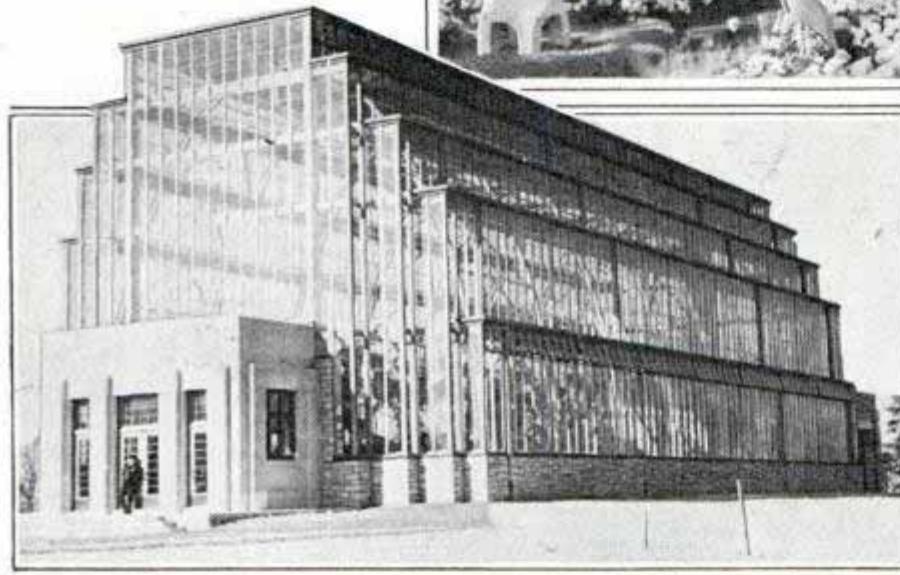


Taping up the broken leg of a canary

Baltimore, Md

Floral Conservatory Is a Skyscraper of Glass

Quite unlike the traditional greenhouse with peaked or arched roof, the new floral conservatory at St. Louis is built like a skyscraper with walls that step back to admit a maximum of sunlight in winter and better control of light in summer. Its vertical surfaces are twenty-four by twenty-six inch double strength panes of glass,



Exterior of the glass "skyscraper" conservatory at St. Louis and interior views showing, at top, the "Japanese garden" of chrysanthemums and, below, the catwalks for workmen at each setback level

fastened with copper glazing strips to resist high wind. Horizontal surfaces of the setbacks are of composition roofing. This type of construction saves breakage by hail, and the shadow from the solid roofing is lessened by its fifty-foot height. Catwalks built permanently at the various levels allow workmen to replace glass without scaffolding. Whitewashing to stop glare in summer is unnecessary, for Venetian blinds are to be installed during that season. There are 15,000 square feet of glass in the walls. The building is fifty-five feet wide and 145 feet long, set in a north and south direction. Aluminum paint covers the steel arches which support the sides and roof, this preventing the fungus growth that attacks oil paint.

Steel in 1937 Car Weighs More

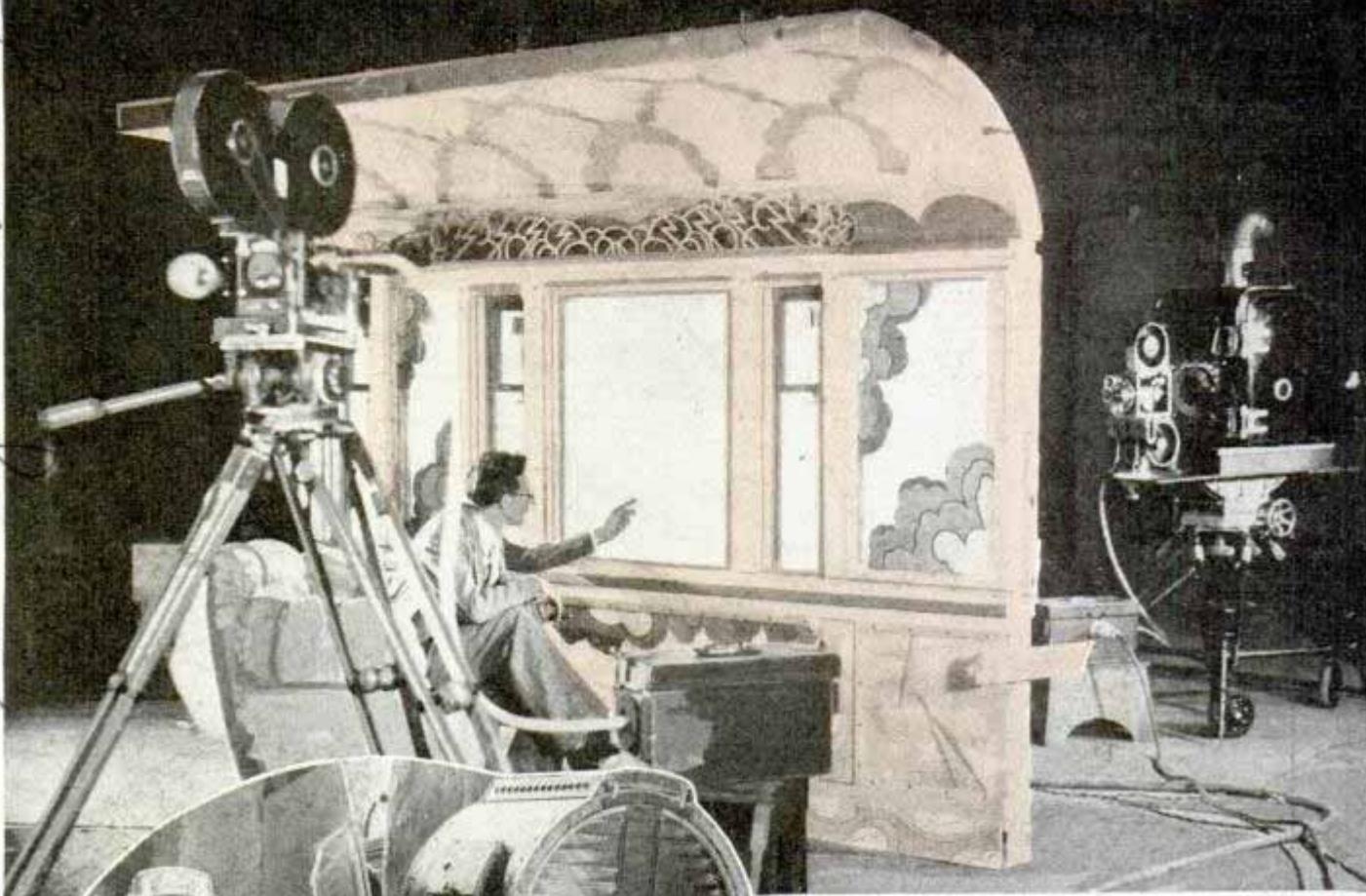
Eighty per cent of the weight of the average 1937 model automobile is steel. The use of alloys has cut in half the weight of cars as compared with twenty years ago, yet in your 1937 auto there is approximately sixty-five pounds more steel than was used in the same model last year.

American dry and
steel auto

F488

Mr. Earl Thressin 8649 Lookout Mountain Road, Hollywood, Calif.

The LATEST



Giant early light and its small present-day counterpart. Top, setup for a "rear-projection" shot.

STEP behind that big battery of cameras in the workshop of Hollywood's movie factory and watch them outsmart nature.

The light that plays on the face of your screen hero is so intense it could start wood burning. Invisible ultraviolet light captures and stores his voice for you. Huge booms that remind you of steam shovels loom through dense artificial fog, thrusting an armful of cameramen into range for a startling action picture. Man-made lightning rips the sky backdrop and drenches the set with light. Sharp-eyed lenses catch the glitter of dew sprayed on a spiderweb spun by no spider.

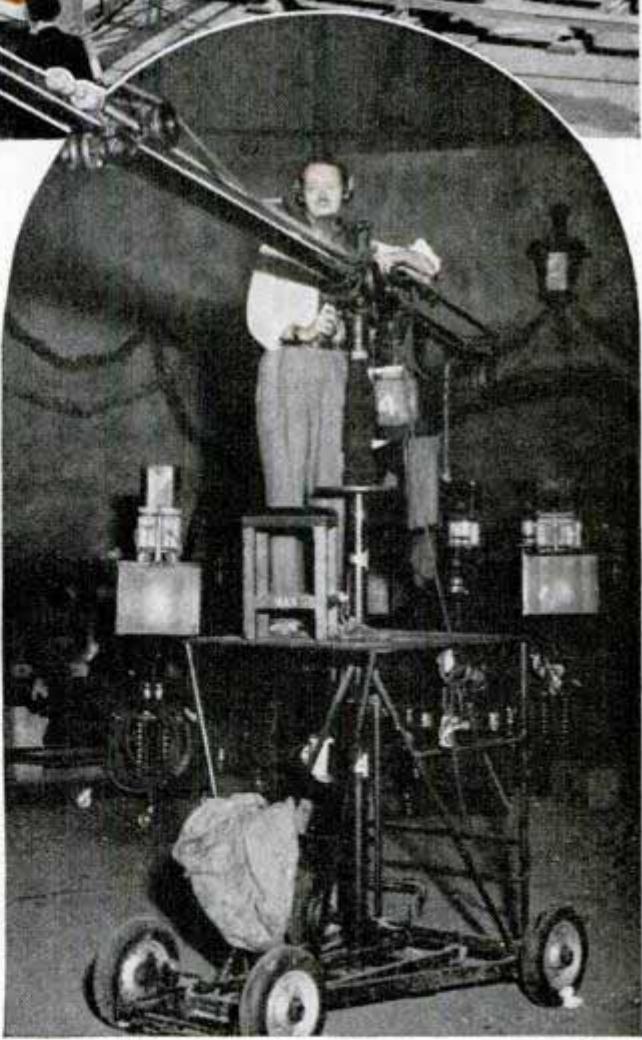
Action is swift—cameras, crews, equipment must be as swift. Twelve-ton camera booms must maneuver smoothly and speedily as the players move about. In a manner not unlike that of a steam-shovel boom, the arm, on

in the MOVIES



which is a platform with seats for the crew and a turret for the camera, is moved about to any required angle during the shooting of a scene. The largest of these booms at the Universal studios can hoist the camera forty-five feet high, and because it is mounted on an electrical conveyance, it has a ground coverage of 600 feet. Five generators operate the boom arm, the turrets, and the electric truck on which it sets. Power-driven rewind drums either roll up or unroll the electric cable between the main power supply and the truck when in motion.

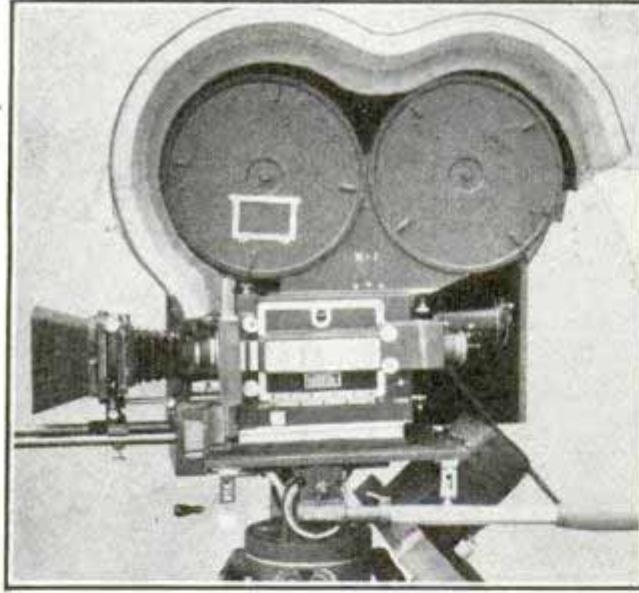
A number of new cameras have been developed, the Mitchell camera being perhaps the most important. This camera is constructed so its elaborate mechanism operates silently in keeping with the exacting demands for silence during the filming of talking pictures. Exact precision and mechanical balance of moving parts is required because the motion-picture camera, operating at normal speed, starts and stops, and thus exposes about 1,440 photographs each minute. This must



Top, electrically operated boom on tracks. It can hoist camera and crew forty-five feet high. Below, sound crane used in following action of players as they move about the stage

Mitchell Camera Corp., 111-111-111, and Co. 387

Under Two Flags



Top, camera truck with very soft tires used for outdoor shots. Below, left, cross-section of early Mitchell camera in sound-silencing cabinet. Right, big fan used for wind effects

be done without appreciable vibration. Cameras used to set up vibrations that recorded as noise in the talkies, and so were encased in an insulated silencing cabinet, called a "blimp." But the new camera is internally insulated so the vibration of moving parts does not reach the exterior of the camera. This camera is fitted to a tolerance of about one ten-thousandth of an inch, or just enough for an oil film between friction parts. It weighs a little more than 100 pounds and costs \$11,500.

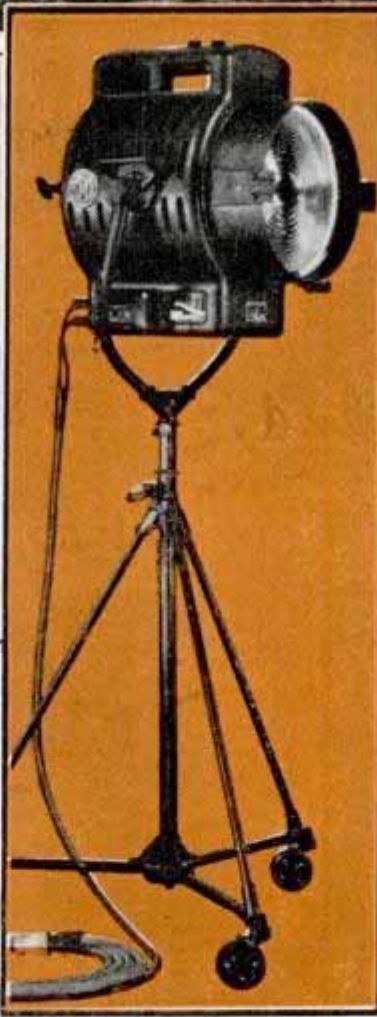
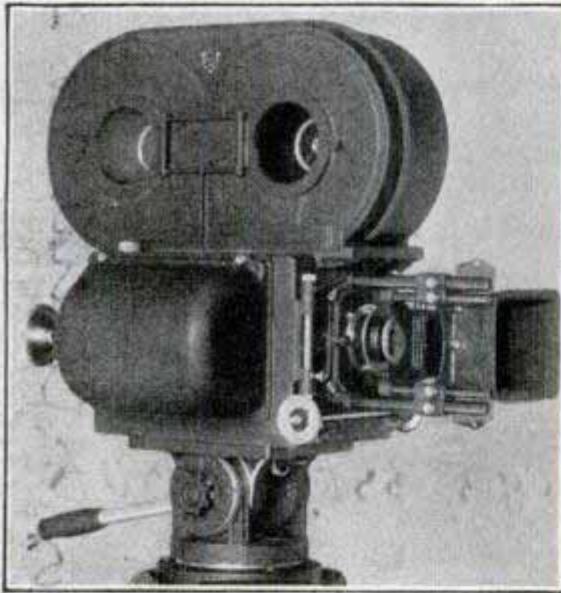
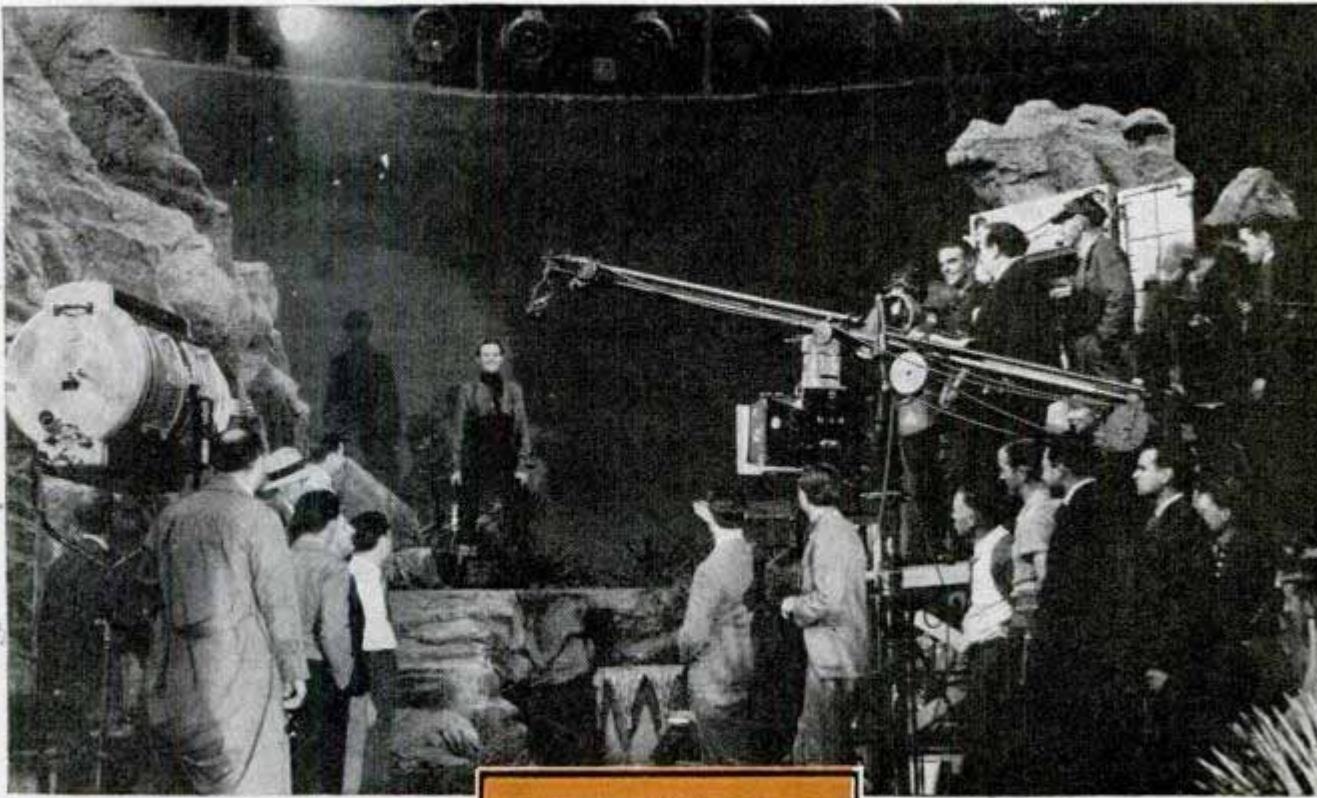
Because many studios still are using the

earlier type Mitchell camera, silencing blimps have been developed which absorb the vibration of the mechanism. By combining layers of insulation such as smoked gum rubber, beeswax, cork, felt and other materials of various densities, all the sound frequencies are "killed." Between each layer of insulating material is placed a solid material which prevents the physical vibrations from being transmitted to the adjacent layer. In this way all the vibrations are kept within the blimp.

Another new camera, the Technicolor, has an elaborate prismatic optical arrangement, the light passing through a single lens being split so three negatives are photographed simultaneously in order to get the necessary negative records of the three primary hues for reproducing in color.

The camera with its silencing blimp weighs more than 500 pounds. Inside the camera case is everything from camphor wells for preventing film shrinkage to tiny electric lamps for sound synchronization starting marks. So delicate and so complicated are these cameras that only six cameramen in Hollywood have been trained to operate them. There are more than 1,000 men who can operate the black-and-white camera.

Technicolor has a novel device which is used on this camera for automatically focusing it from remote distances. By this device, consisting of two synchronous mo-



Top, using sound crane to pick up voice of actor during filming of scene. Below, left, Mitchell silent camera, showing the enclosed motor. Right, a 5,000-watt "solar spot," the most intense light used in making the motion picture of today. Note its compact size

tors, it is possible for the cameraman to keep his camera in focus even though he be 500 feet from it. By manipulating a dial to which is connected a "geared-down" motor, he controls the second motor on the camera which operates a rack on the lens.

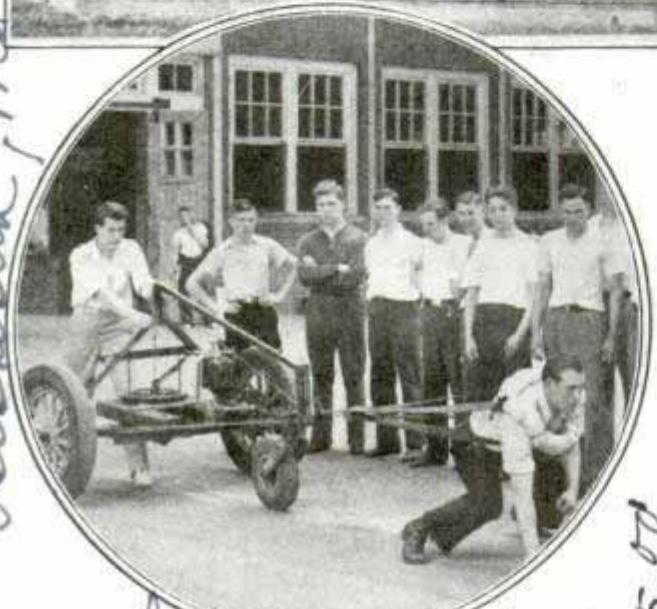
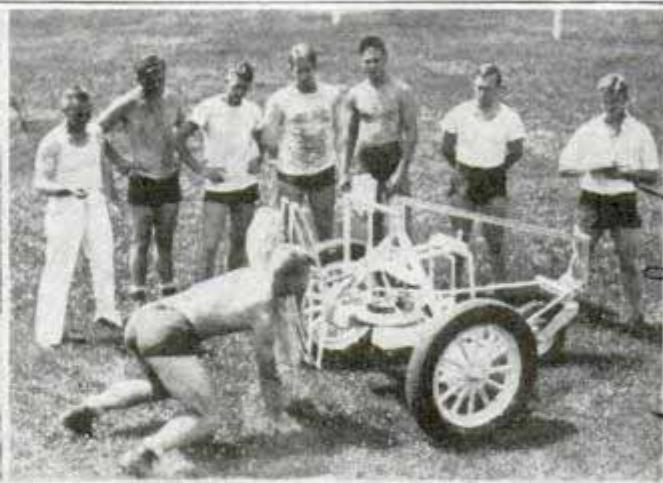
New lamps, new optical systems and lighting equipment made of lightweight alloys are now in use. Whereas six men were needed to handle the older type lighting units which

weighed about 120 pounds, the new equipment constructed of aluminum and alloys weighs only sixty-seven pounds for the same size unit and may be handled by two men. Art Reeves designed a lighting unit that weighs only two pounds, including cable, reflector, and a stand that will hoist the light twelve feet high. It is used at present by newsreel photographers. Another portable light recently introduced is the "Cinelite," which uses a 1,000-watt photoflood lamp.

The new lighting equipment includes reflectors which diffuse as well as reflect the light for larger and more uniform coverage. The earlier reflectors and optical systems usually projected a light pattern that was "doughnut" shaped. The light had a bright rim with a dark center which made it difficult to illuminate evenly large surfaces or groups. A parabolic reflector called the

(Continued to page 114A)

Measuring the Horsepower of a Football Star



Top, bucking machines test charging power of football players and translate their ability into terms of horsepower. Below, college athletes pit their pulling strength against the dynamometer on wheels

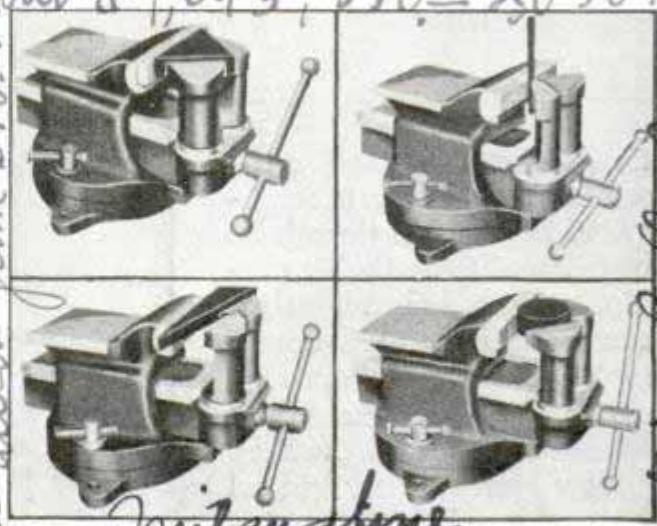
ords of 1.66 horsepower each; in a large group of players the range was from .75 to 1.66 horsepower. The average 155-pound athlete in a group of more than 700 freshmen rated one horsepower. Similar principles were applied in building a bucking machine to test the charging power of the athlete. A padded spring gear received and recorded the initial lunge, the arrangement being such that the recoil of the spring had no effect on the result.

Lafayette, Ind.

When you charge into a 200-pound football star on the gridiron you are bucking a 1.66-horsepower athlete. Manpower is being translated into terms of horsepower at Purdue University with a testing contrivance rigged up by Prof. W. E. Clevett of the physical education department. It consists of the rear end of a junked automobile, a small guide wheel, a stout spring, a standard and a lifting dynamometer, an oil pressure pump, and slide weights with cable and pulley. For a pulling test, the athlete slips a padded harness over neck and shoulders; his first lunge lifts a weight of about 110 pounds and then he must have the leg drive to keep this weight in suspension and pull the rig thirty feet forward against time. The oil pump blocks the machine until the contestant has pulled up the weight, and then he pulls a constant weight. Three 200-pound football players established equal pulling re

F15 48.
Shop Vise with Two Swivel Jaws

Handles Variety of Jobs



Illustrating different kinds of work for which this handy vise may be used

Constructed with two swivel front jaws and a stationary flat rear jaw, a Japanese made vise handles almost any type of

Kanagi Shorten

work, triangular, rods of large or small diameter, T-sections or wedge-shaped objects, as well as the usual jobs. The front jaws may be adjusted at the desired angle to hold irregular-shaped work, or each may be used alone. The vise is small-size, built of cast steel.

F1550

Spray-Gun Adapter Fits on Rim of Paint Can

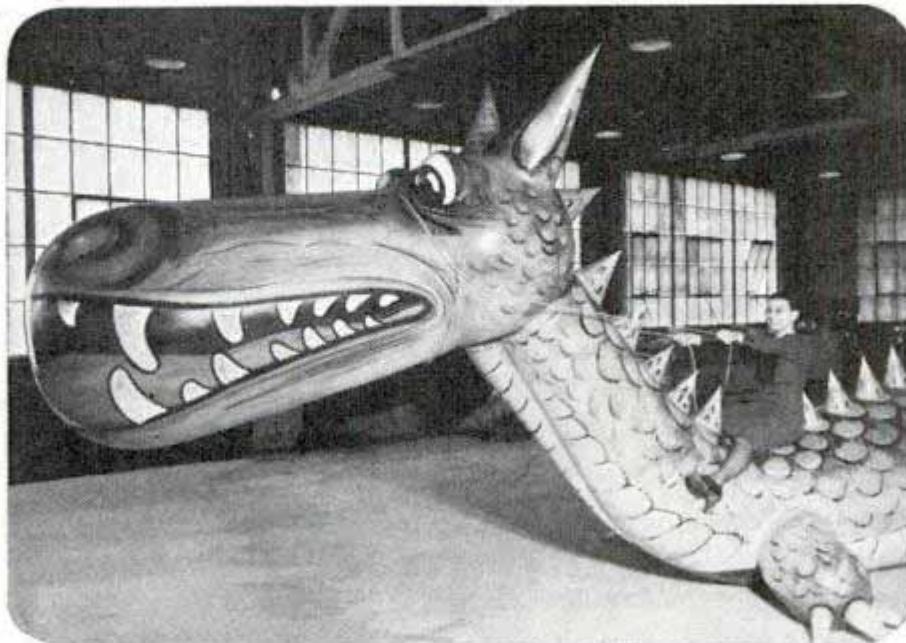
Paint cans are now being constructed so that a spray gun can be attached to the top with a special cup adapter. This saves time and labor for small paint jobs requiring various colors. Simply attaching the can to the spray gun, the painter can apply a coating and then cover the can for future use. Then, cleaning the gun with some thinner, it can be attached immediately to a can of another color.

A. R. Cunningham



Pat. A.
Drawings show how adapter fits rim of paint can allowing spray gun to draw directly from can

Giant 'Monsters' for Parades Constructed Like Balloons



This "monster" will be a feature of parades or carnivals. It is made like a balloon and may be inflated with helium

Aeron Olico

Constructed in the balloon room of the Goodyear Tire and Rubber company, strange "creatures" known as "figure balloons" become feature attractions in parades and on holidays. One of the latest is a dragon measuring 150 feet from nose to tail. The larger "monsters" are inflated with helium and manned by crews who hold them to the desired height by hand lines, much in the manner of taking a blimp in or out of dock. The figures are built of the same materials as the balloons used for military and commercial aviation. Smaller figures, designed for inflation with air, are carried or mounted on trucks for parade and display purposes.

F1566 Lecter - Del.
**Auto Reflectors Resilvered
by Dipping in Liquid**

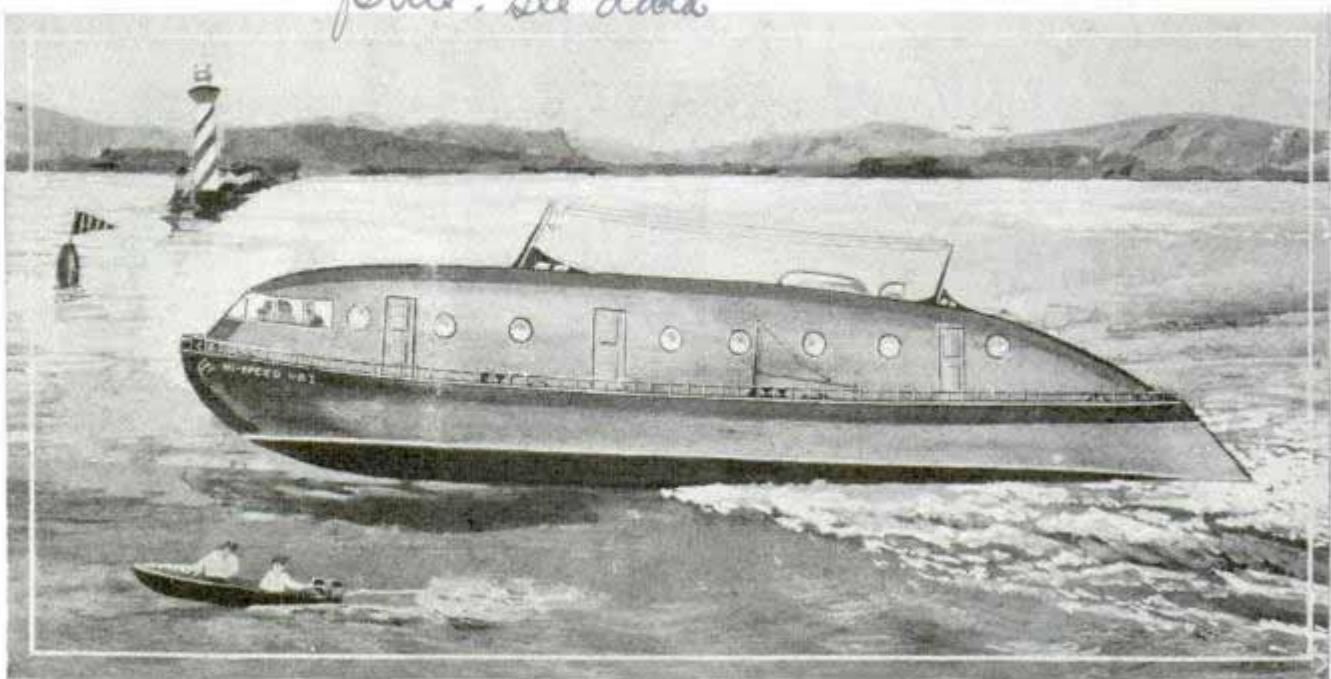
Reflectors of automobile headlamps can be resilvered easily by dipping them in a solution after they have been cleaned and polished. The treatment requires no heat or electric current. The plating is accomplished quickly, the solution doing its work in less than one minute, and the interior of the reflector will take on mirrorlike brilliancy with little polishing.



Sherwin Williams *Clasper Chemical Co.*

Streamline Tanker Has Neither Keel Nor Ribs

pure, see date

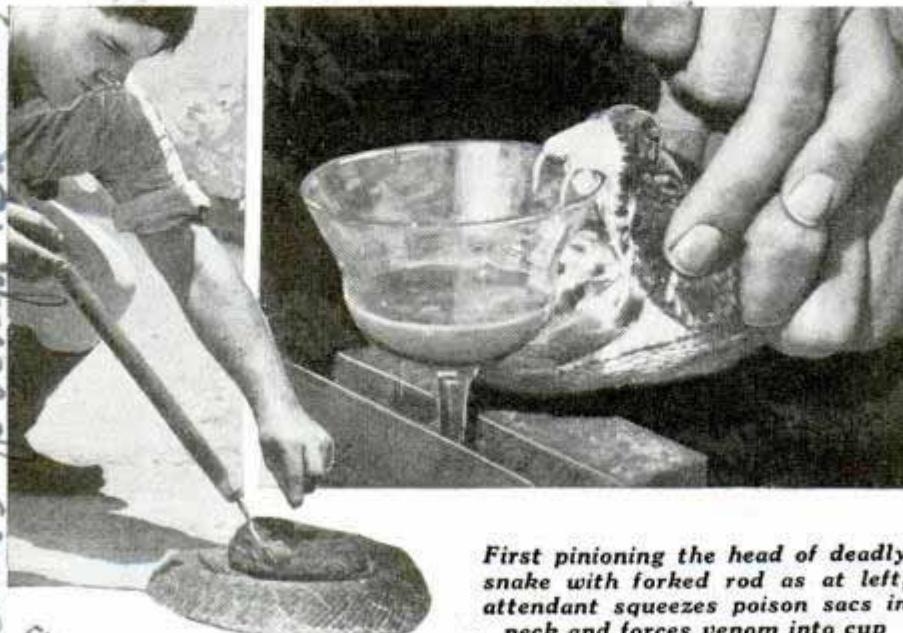


Notice how this tanker "planes" on the water at high speed, reducing the friction. Its hull has neither ribs nor keel, being made of a roll of sheet metal bent and welded into a single rigid piece

Streamline tank boats without keel, ribs, stem or sternpost are being built in a Michigan factory. The bottom and sides are shaped from a single roll of sheet metal bent and welded into a ribless, rigid hull eighty-five feet long, thirty feet wide and ten feet deep. Non-sinkable rowboats and small powerboats have been built on the same principle, attaining speeds higher than fifty miles an hour with small horsepower. These tankers are to be pow-

ered with twin engines of 1,000 horsepower and are expected to travel at forty miles an hour light, and twenty to twenty-five miles loaded. This type of ship, with in-curving bottom, rises to the surface when under headway, "planing" on top of the water and thus reducing friction. Loaded to a depth of nine feet, it is expected the tanker will draw only four feet when in motion. The inclosed superstructure is curved to cut wind resistance.

1952 Rattlesnake Farmers "Milk" Reptiles for Their Venom



First pinioning the head of deadly snake with forked rod as at left, attendant squeezes poison sacs in neck and forces venom into cup

"Milking" deadly water moccasons and diamond-backed rattlesnakes of their venom is the dangerous business of E. Ross Allen and his staff at the Florida Reptile Institute. The head of the reptile is caught with a metal-tipped stick and pressed firmly to the floor of the milking pit. Then it is grasped at the neck just behind the jawbone, and while an assistant holds the wriggling body still, Mr. Allen forces the snake's mouth open by

pressure at the side of the neck. The fangs are then held to the lip of a little glass cup into which the venom is discharged by squeezing the poison sacs situated just behind and below the eye. Fifty-nine snakes were milked in thirty minutes in this manner, Mr. Allen believing that at high speed the men are more alert to perceive and avoid danger. After extraction, the venom is placed in refrigerators and later dehydrated and shipped, in crystal form, for use in medicinal laboratories.

F/543

Fliers Summon Aid with Kite Built of Wrecked Plane

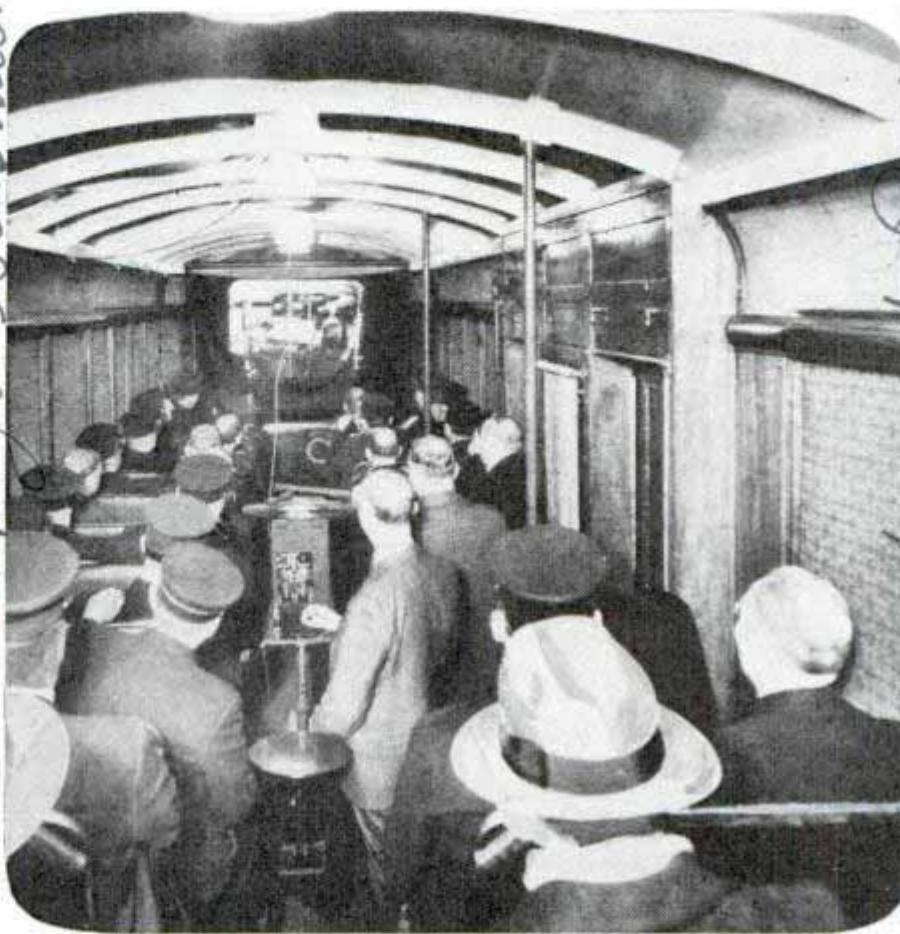
Three army fliers used their heads and saved their lives when their ship ran out of fuel and they were forced to make a landing in a remote section of northern Australia recently. They realized that pilots searching for them were likely to miss them, so they made a kite from parts of the smashed ship and sent it aloft. Nine days later a searching plane noted the kite and rescued the fliers.



© Sidney Morning Herald

F/543 Kite made from wrecked plane to signal for help

Trolley Car Is Schoolhouse for Street-Railway Employees



F/543 Streetcar men go to school in a streetcar. Educational movies are shown in this remodeled trolley, which travels around the Cincinnati system

Conductors and motormen of the Cincinnati street railways attend class in a traveling schoolhouse—an old trolley car remodeled. Once in regular passenger service, it is now equipped as a theater with a motion-picture screen at one end. Veteran employees and new men alike are shown instructive movies dealing with salesmanship, courtesy and efficient handling of the streetcar.

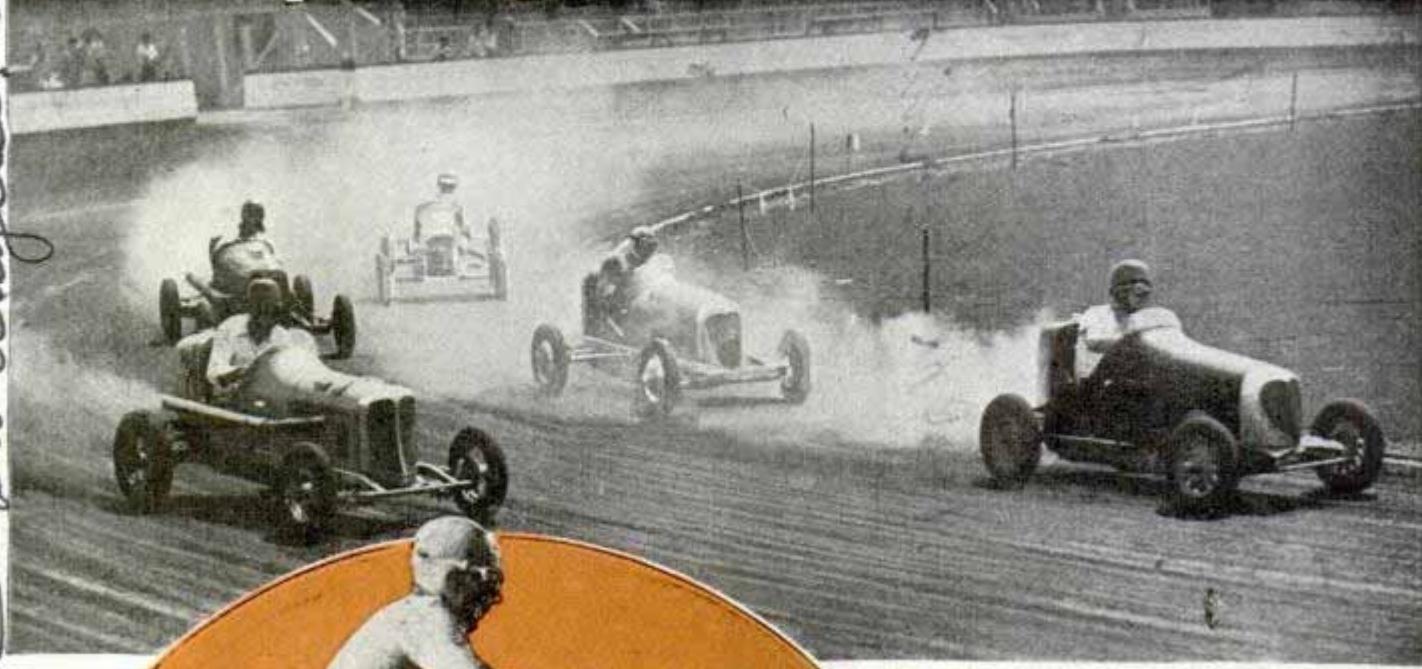
F/547 Air-Cooled Coaster Brake Latest for Bicycle

Built like an airplane brake, the latest bicycle brake is air cooled. It has only one internal moving part with the ball bearings while pedaling and no internal moving parts except the bearings while coasting. A triple flange design gives a large cooling surface. The brake has a grease connection and requires only one "shot" every 1,000 miles.

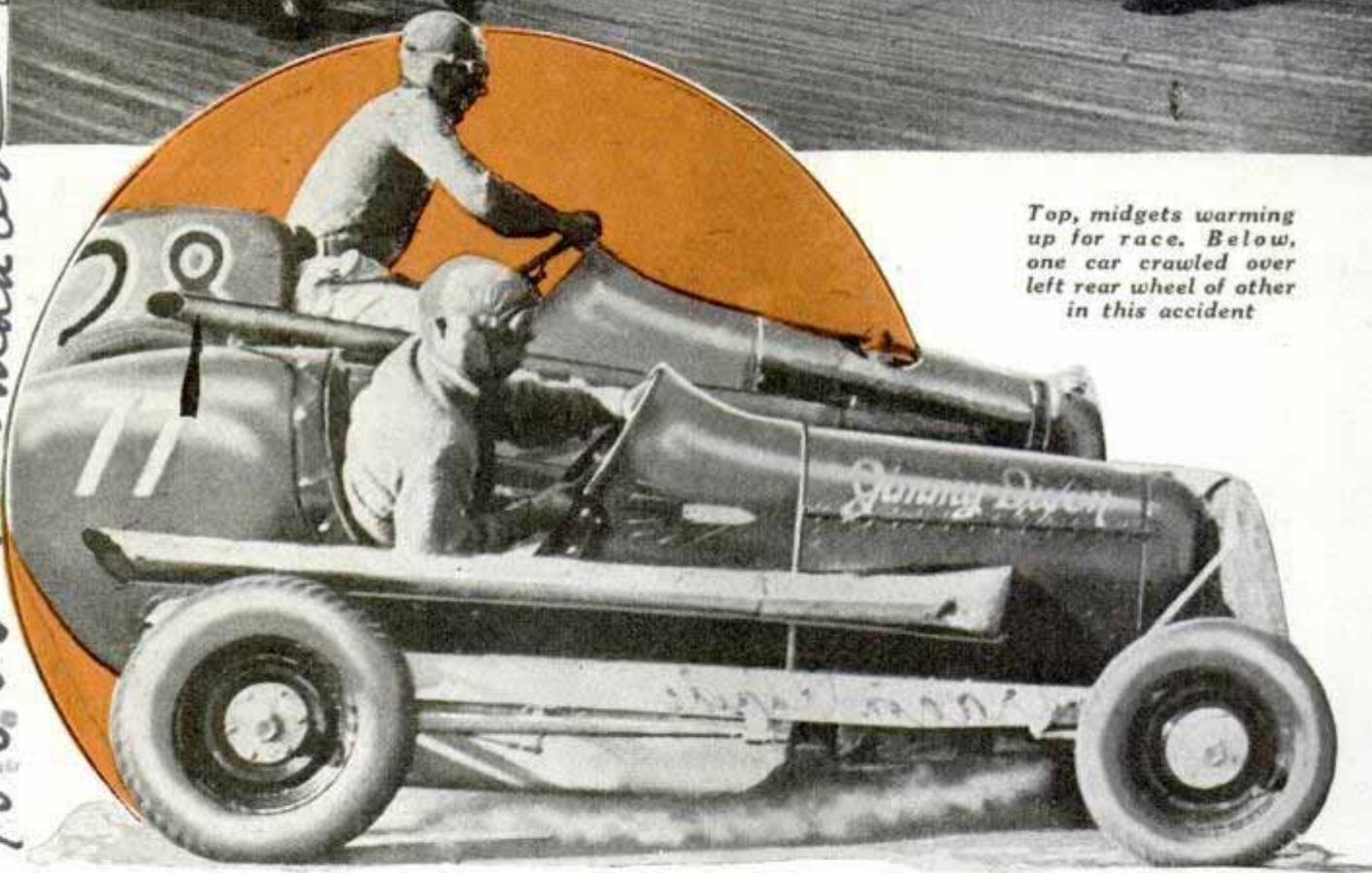
F/547 Musselman Hub Brake Co.

+1563.

Mighty MIDGETS



Top, midgets warming up for race. Below, one car crawled over left rear wheel of other in this accident



Com. Thomas S. Flynn, Jr.
10565 Potrero Ave., Los Angeles, Calif.

MIDGET auto racing, which started as a vacant-lot pastime a few years ago, now has attained the prestige and glamour of a big-time sport. Laughed at and derided at first as a game of "motorized kidie cars," the tiny race cars are attracting thousands of enthusiastic fans who root for their favorites and closely follow the standings of the different drivers.

Part of the fascination is that the races are held "right in your lap," so to speak.

From the grandstand you get a close-up of the whole track and can follow the flashing cars every inch of the way. On a vest-pocket scale you get all the thrills and color of an Indianapolis classic.

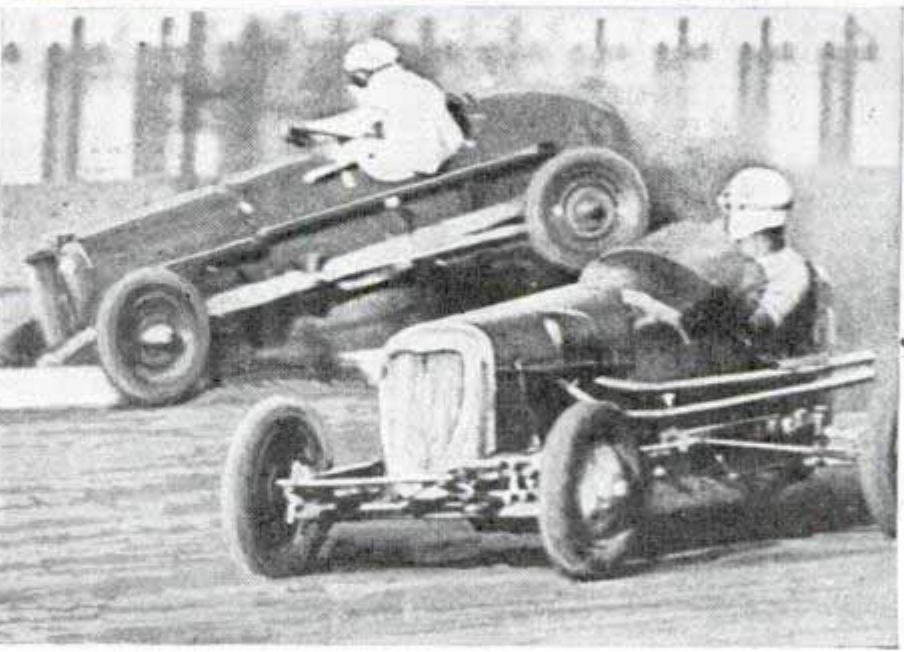
Another reason for the popularity of the peewee racers is that they offer more action than do big cars. With as many as two dozen midgets roaring in a tight pack around the turns and into the straightaways, collisions are bound to occur. Fre-

of the SPEEDWAYS

quently two cars lock wheels and go skating along for yards before they separate. In a turn one car is apt to slide sideways into another. Occasionally a wheel comes off or a driver loses control and plunges into the infield. Sometimes a leader falters and a car right on its tail rides over one of its wheels.

Breath-taking accidents like these would mean almost certain death in a big-car race but among the midgets it is only part of the game. The drivers get away with it because their cars are lighter and are built closer to the ground. Some of the drivers have been in dozens of collisions without suffering a scratch. Fatal accidents are uncommon although they do happen now and then, sometimes the result of a collision that tosses a car full speed against the safety wall that surrounds the track.

If you know what to look for during a race, you may observe many things that are missed by the average spectator. The best place to see is at the beginning of a turn. From here you can watch the cars weaving down the straightaway toward you and then see them shut off and start their slides into the "corner." But be sure to keep away from the fence if the track



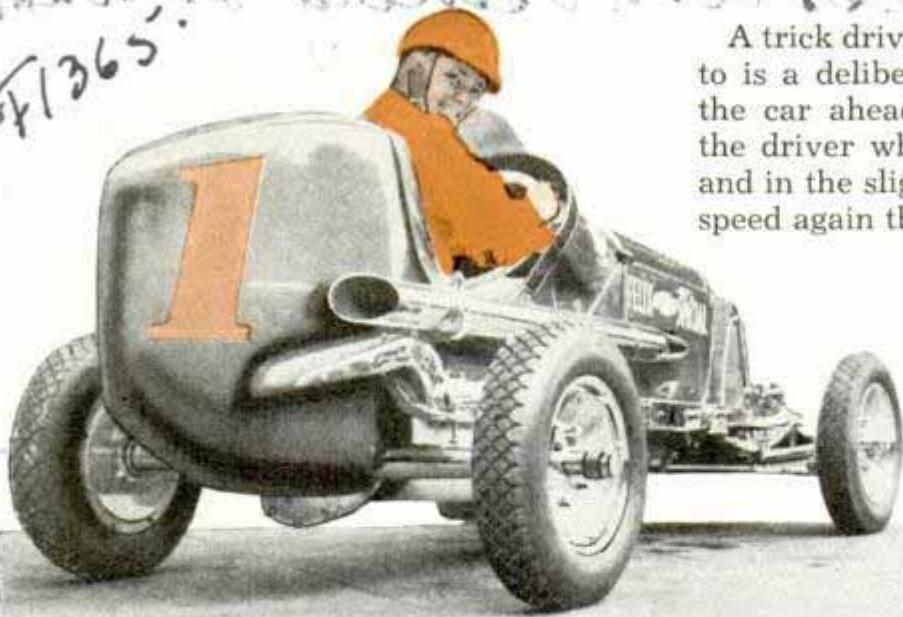
Driver of midget racer wearing crash helmet and goggles and, below, midget car leaping a guard rail after collision with the racer in the foreground

Driver of midget racer wearing crash helmet and goggles and, below, midget car leaping a guard rail after collision with the racer in the foreground

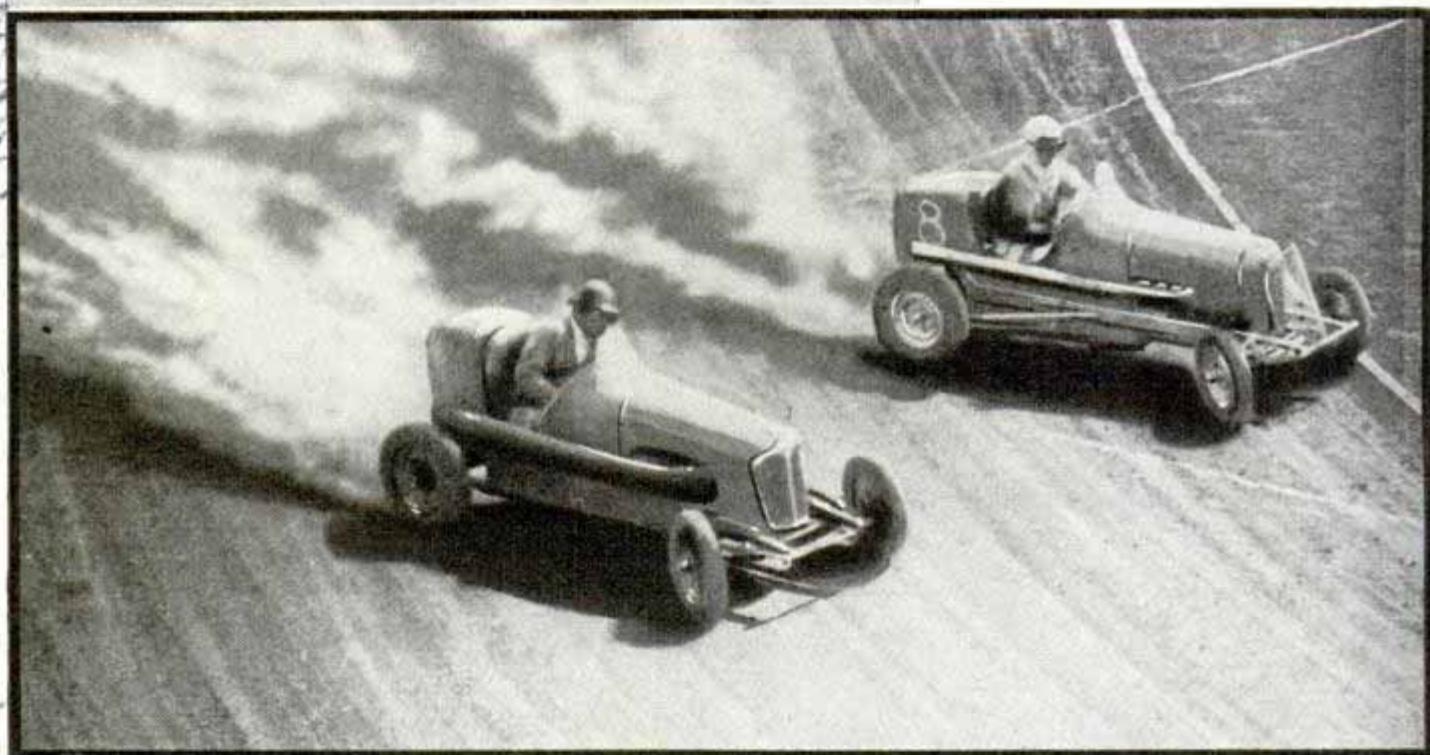
*Re march 1939. 38.6
American midget drivers
38/12*

Donnae Hanchester

2aeiles and Beverly Los Angeles



A trick drivers have been known to resort to is a deliberate rear-end collision with the car ahead. The natural tendency of the driver who is struck is to slow down and in the slight interval until he picks up speed again the following driver may have time to pass him. A bump like this must be made to appear accidental for if one driver seems to be having too many such "accidents" he is apt to be flagged down and warned. Most cars these days are equipped with tubular guards around



Midget racers in a controlled slide on a turn and, above, close-up of midget racer, showing how closely it resembles its big brothers of the speedway

is unpaved because the wheels of the cars toss a barrage of clay and soil into the lower seats.

When the cars roar around the track three deep for a flying start, only to be waved back time after time, uninformed spectators are apt to think the drivers are incompetent. The real story is that the driver in the pole position happens to have better acceleration than the other cars. He wants to set a slow pace past the starting line, knowing he can "dig out" and beat his rivals to the first turn. The other drivers are trying to force him to a faster speed where they will have a more equal chance to take the lead.

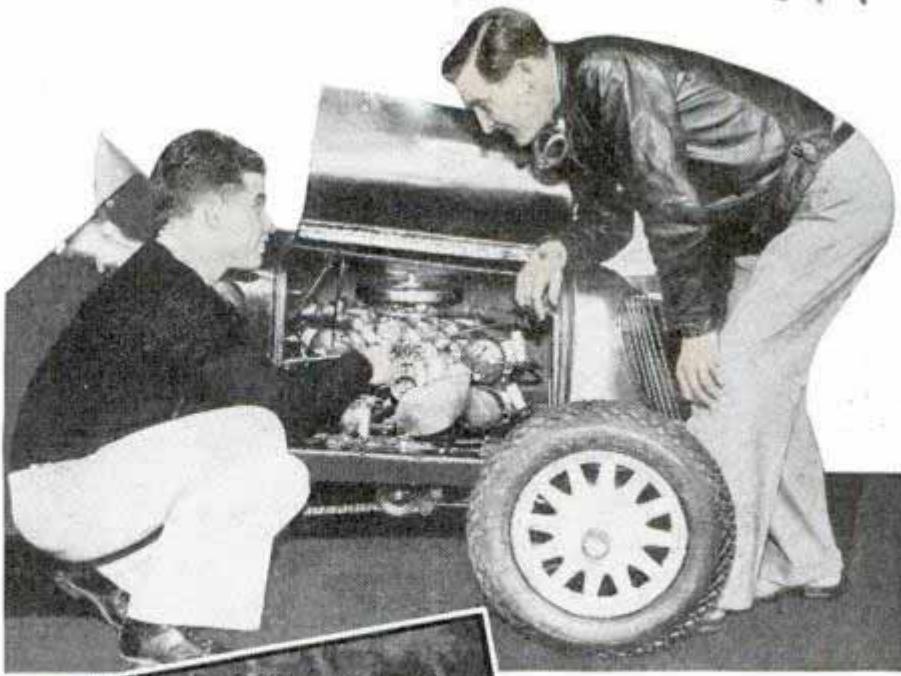
the streamlined stern to protect the sheet metal from such bumps.

On the unpaved tracks, dirt and pebbles are real hazards to the drivers. After a season of hard racing the front end of a car may be covered with dents. Radiators are apt to become clogged with dirt in spite of screens and after every heat the drivers clean out radiators and screens with compressed air.

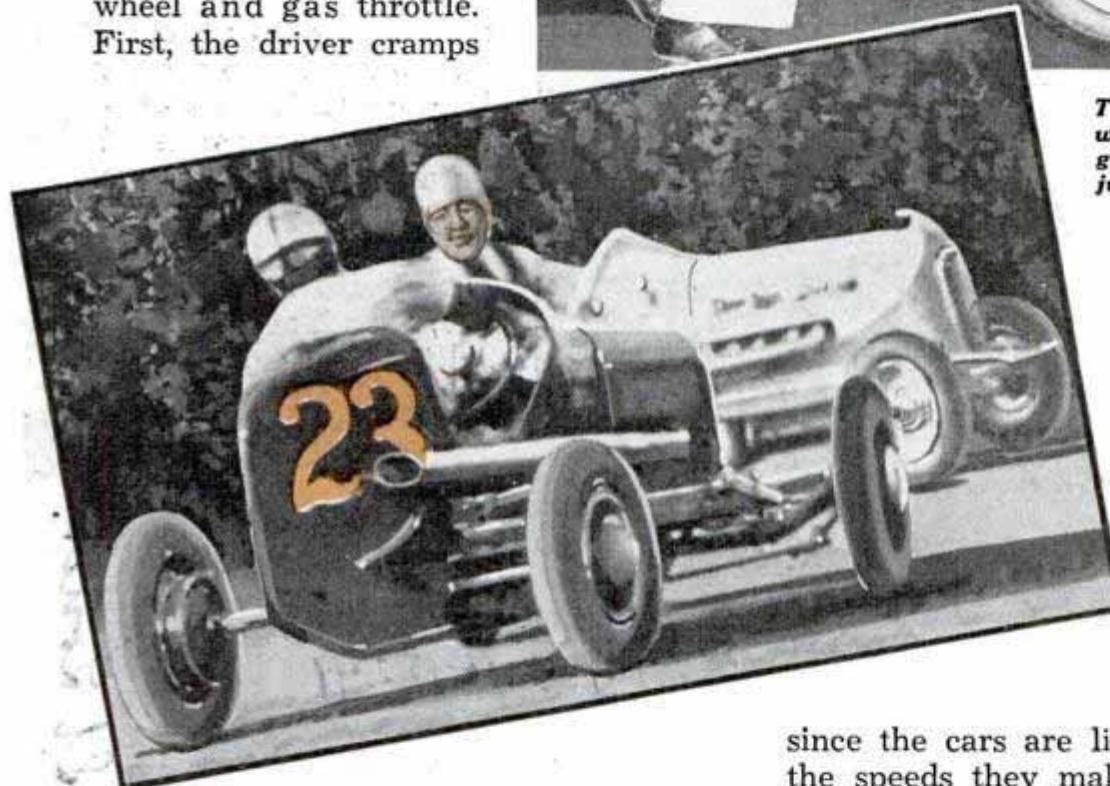
If the midgets are safer than the big cars, they are also harder to drive. On the short tracks there isn't time for a driver to look around much because his car handles so fast he must work every second. Making seventy miles per hour on the

straight stretches, the cars are comparatively faster, considering the short lengths of track, than the big cars that race on longer tracks.

Drivers of the midgets "steer with their feet" in the turns. The fastest way to get around a turn is by a controlled skid with the car sliding at a forty-five-degree angle. To make the slide properly requires careful coordination of the steering wheel and gas throttle. First, the driver cramps



Top, midget racer powered with outboard marine engine. Left, this driver has just dodged car stalled on track



the wheel to enter the turn, then steps on the throttle to start the rear end sliding. If he slides too broadly and threatens to spin he can correct it by speeding up and pulling the front wheels a little in the opposite direction. Always being on the verge of a spin, a light tap from another car may be enough to start a car "swapping ends" or sliding backward down the track. Once a big racing car starts to spin, its weight keeps it going, but the midgets are so light that they usually stop spinning after two revolutions.

It takes a different driving technique to win at midget racing because well-matched drivers find it hard to pass each other on the short tracks. Passing on the

turns is difficult since the cars are normally pushed as fast as they will go without spinning. This puts a premium on the pole position in the starting line-up. It is just about true that many races are won before they start,

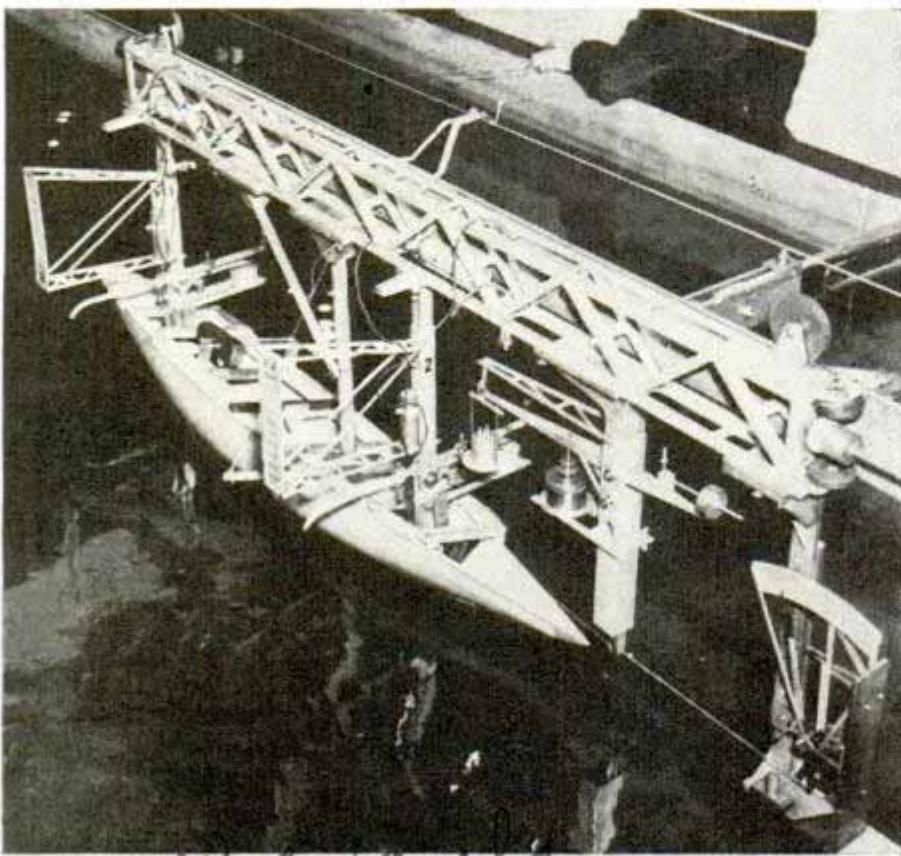
since the cars are lined up according to the speeds they make in the qualifying dashes, and the fastest driver gets the pole position. If he can hold his advantage into the first couple of turns, he is well on his way to victory.

Track officials sometimes announce an inverted start and place the slowest cars in front. The fast drivers like to learn about this in advance so they can govern their qualifying speeds accordingly, but these starts are usually ordered without warning. In spite of their smaller size, the midgets are as carefully built as their larger brothers. They are about two-thirds the size of ordinary one-man racing cars. The heaviest power plants weigh 850 pounds as against the one-ton weight of a full-size racing engine. Wheels are

(Continued to page 118A)

F15 36

Model of Cup-Race Yacht Given Speed Test in Basin



Model of racing yacht's hull being tested in basin. Note measuring devices which record resistance to water when hull is tilted

Models of the new yacht which will defend America's cup in the next race are being tested in experimental basins to determine the efficiency of hull design. In a recent test at Stevens Institute, the model was suspended from an overhead carrier which towed it through the water while various instruments recorded the resistance offered by the hull while tilted at different angles. Many of the conditions to be encountered during an actual race are duplicated in the test basin.

F15 3.

Rubber-Tired Trailer Wheel Fits Parking Leg



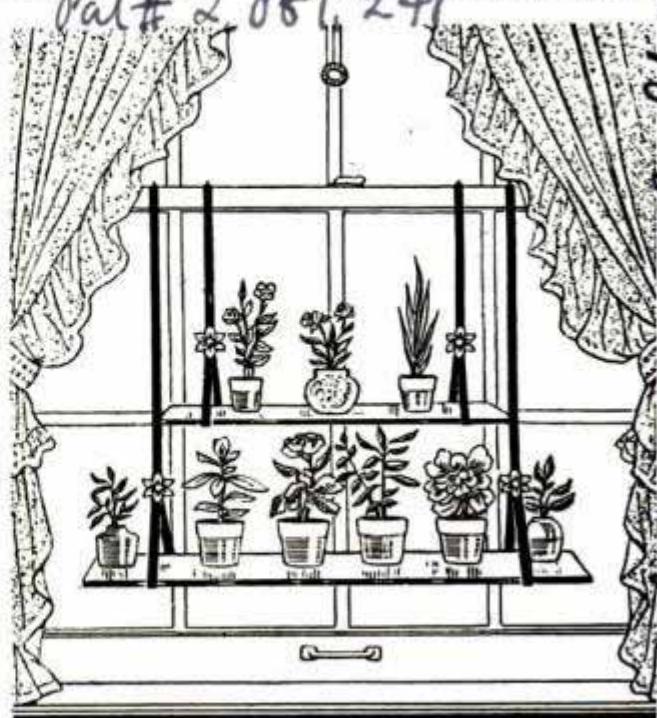
Designed to fit the parking leg of trailers, a small rubber-tired wheel with caster mounting is available. The wheel carries a 10 x 2.75-inch tire, of the doughnut type. At-

tached to the trailer, the wheel will help support the load on the road, relieving the tow car and the hitch apparatus of considerable weight.

F1501

Shelf of Glass Hangs Atop Window Sash

Designed to hang on the top of the window sash and to move up and down with the window, a glass shelf now on the market is both useful and decorative. Made of steel brackets with three-sixteenths inch polished glass shelf, it will not rust nor tarnish. Painted white, green, black, canary yellow or Chinese red, it lends an ornamental touch to the room, in addition to serving the usual purposes of the extra shelf. The shelf comes in several sizes, from twenty inches to twenty-eight inches long. It hangs from two small screw hooks inserted in the sash.



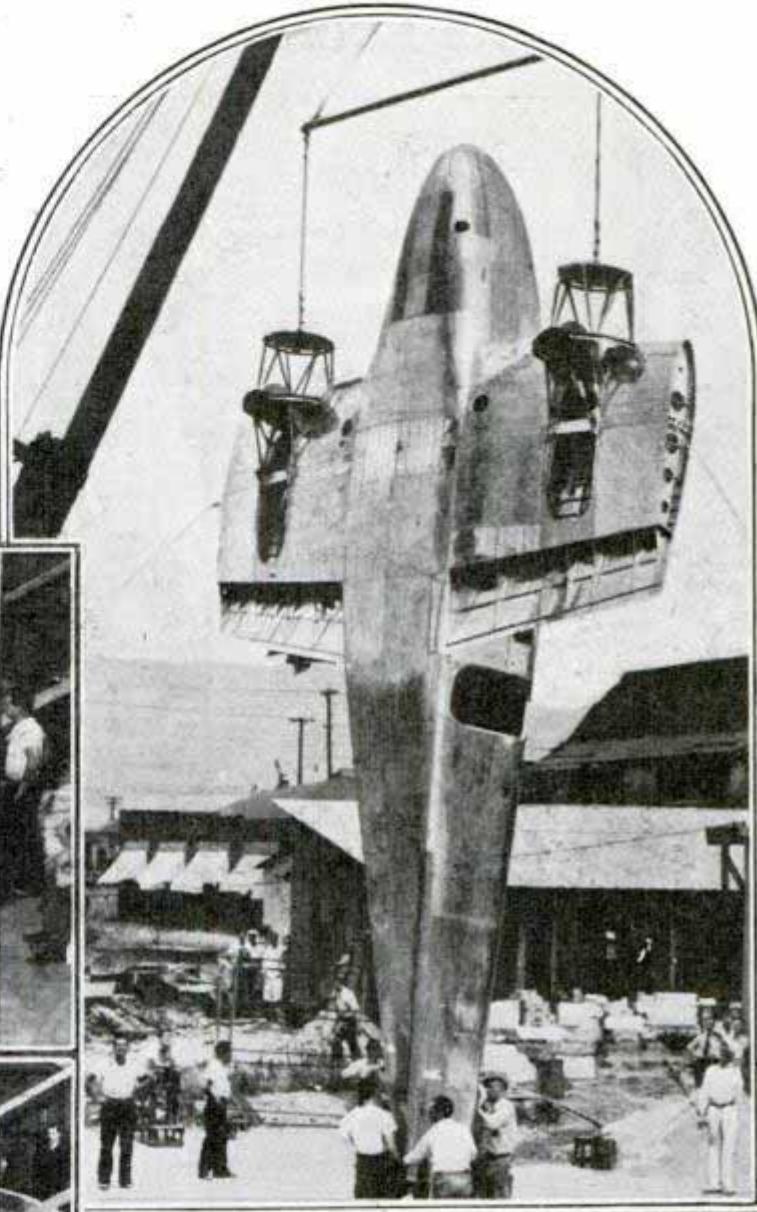
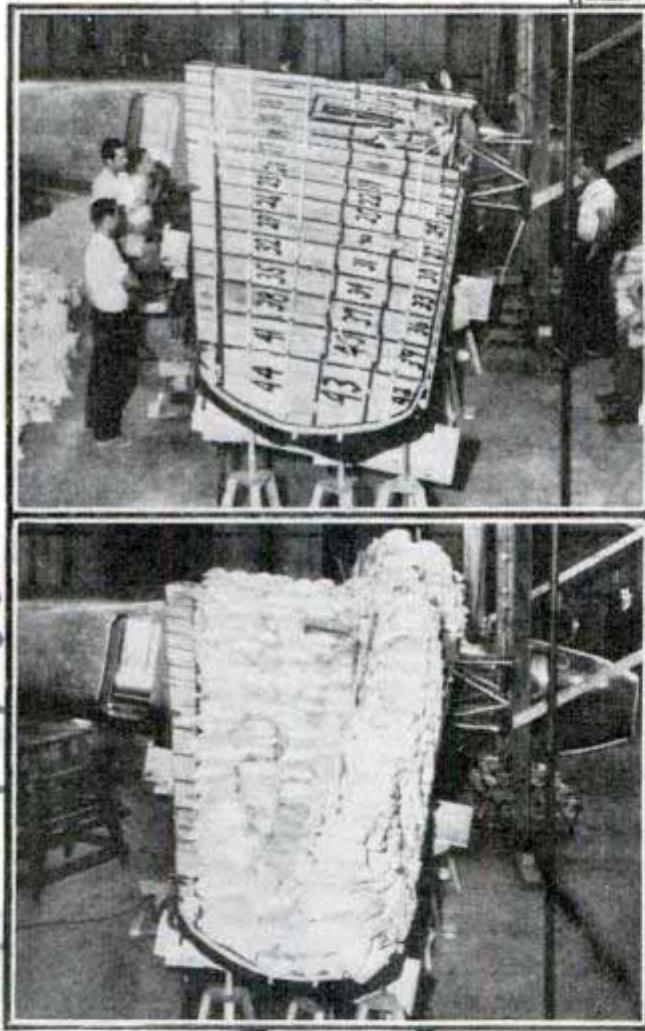
Double glass shelf attached to window

*Musselman Products Co
6227 11th Street, D.C.*

Mr. M. H. Digger

Plane Takes Wing-Loading Test Lying Down

When the time came to test the strength of a transport plane's wings, it was flipped over on its back and took the test lying down. Cables attached to the engine nacelles hoisted the eight-seater metal monoplane, nose upward, and laid it down to be loaded with nineteen tons of sandbags. Fourteen tons were piled on the wings and five tons on the engine nacelles to represent the severest load factors that could be encountered in actual flight.



Above, cables pick up metal frame of big transport plane to lay it on its back for wing-loading test. Top picture at left shows the overturned plane, the underside of its wings marked and numbered to receive the sandbags. Below it is seen fully loaded, five tons of sandbags piled on the engine nacelles and fourteen tons on the wings. Under this stress the wing-tip deflection was about eight inches

7/6/24 Deaf Taught to Hear Vibrations in Toes and Fingertips

By making the whole body an "ear," scientists are teaching the deaf to hear and interpret sound by its vibration patterns. It is predicted that within a few years doctors will know how to fasten a little vibration instrument to the toe of a child born deaf and enable the baby to

overcome its handicap. Deaf children today are taught vibration patterns of speech and music by placing their fingers on a "phonotactor" into which the teacher speaks or music is played. The vibrations are carried through the skin and along the bones to the brain centers.

Scooping up Leaves Is a Job for Snow-Loader in Autumn



Wade Worrell
Brooklyn keeps its automatic snow-loader at work out of season, using it to load trucks with piles of fallen leaves

As a preliminary to its winter's task, a snow loader in Brooklyn was enlisted in the autumn work of collecting leaves from the city streets. Huge piles of leaves were scooped up from the gutters and loaded into trucks for removal.

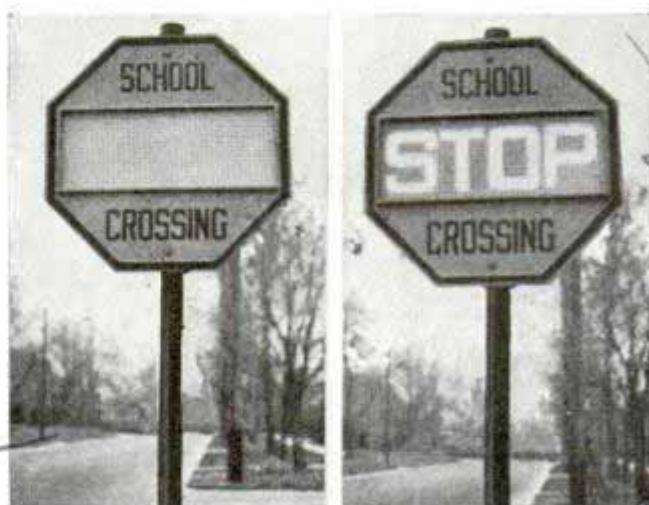
Short-Wave Radiophone Speeds Work at Observatory

F168 Two-way radio telephones keep scientists at California Institute of Technology in close touch with work being done on the institute's observatory atop Palomar mountain. The 200-inch mirror completed recently at an eastern glassworks will be

Encarnate Enguis 11/2/36
installed at the observatory. In four or five conversations daily, members of the institute's staff talk by radio to construction foremen, thus speeding up the work. The system employed is an ultra short wave hookup of two stations officially licensed and operating on a frequency of forty-one megacycles. The distance between the institute and the mountain-top observatory is about ninety-three miles.

~~F1485~~ Time Clock Lights "Stop" Signal in School Hours

Automatic control of traffic near schools has been solved in Lincoln, Neb., by a flasher signal operated by a time clock. When school is not in session the standard highway sign reads "School Crossing," its middle strip remaining blank. During hours when it is needed to protect children at the intersection, the electric time clock flashes "Stop" in red letters across the center strip.



"Stop" signal is invisible except at school hour, when time clock turns on the lights in middle strip

cont. Page 86

Pasadena Calif.

Tiny Newspaper Is Issued from Model Plant

From a miniature model newspaper plant three feet high and five feet square has been issued one of the tiniest newspapers ever published. Printed with pygmy plates, the paper is only an inch high and three-quarters inch wide, yet its headlines are easily read with the unaided



ACTUAL SIZE

This miniature newspaper was printed in the plant shown at top, a model of the Buffalo Evening News building. At the left is a view of the interior showing the tiny rotary presses and typesetting machines

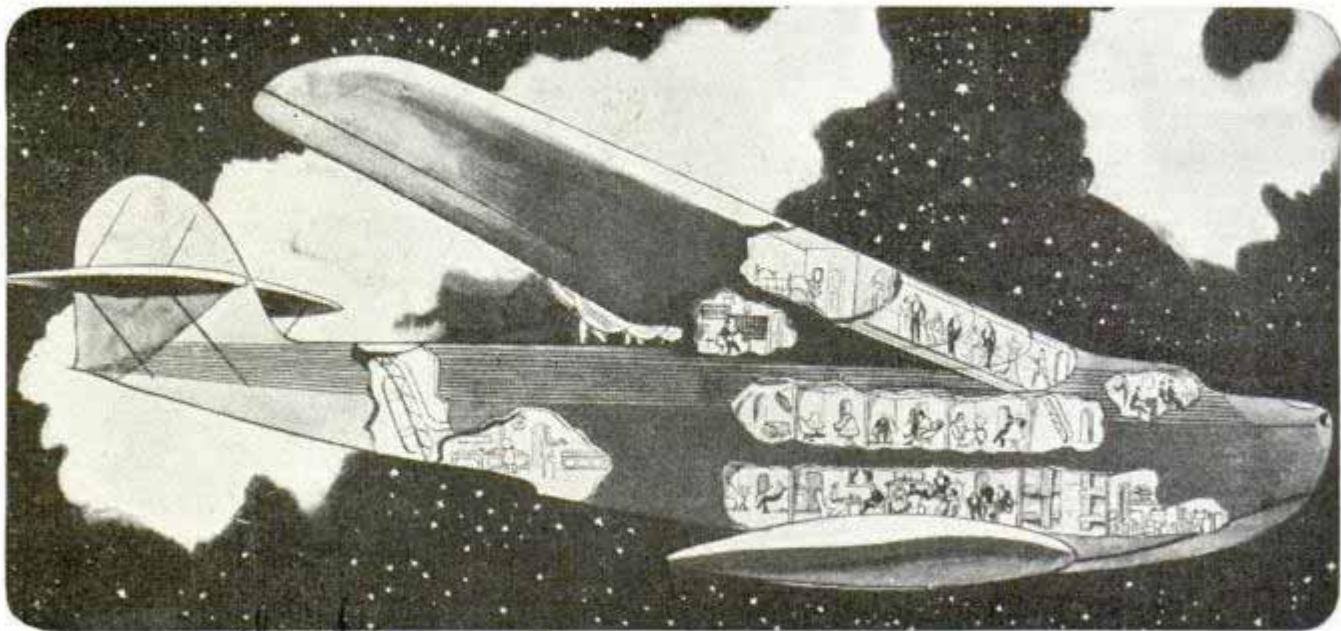
eye. A linotype operator of the Buffalo Evening News spent eighteen months and \$500 building the model and equipping it as an exact replica, inside and out, of that newspaper's plant. Even tiny telephones on desks, and trucks rolling out with newspapers, copy the original faithfully. Base of the building is of maple and walnut, walls and floors of tempered pressboard, windows of transparent material and roof of fine gravel laid on glue. To simulate a brick exterior, linotype slugs separated by parallel rules were made into a block one foot square and printed on heavy red paper which was pasted on the walls. One hundred lamps light the interior. Miniature paper feeders are located in the basement under the baby presses on the first floor. The three presses, three and one-half inches high, were made of fiberloid, brass and maple doweling, their cams and gears cut with special tools. The levers of the

presses are one-eighth inch long and one-sixteenth inch wide. On the second floor is a financial room and a telegraph room containing toy teletype machines and press wires. Paper rolls, twelve-unit presses, automatic plate caster, mail room and engine room are located on various floors. In the composing room are thirty-two linotype machines two and three-eighths inches high, of fiberloid, maple, aluminum, wire and thread, each containing all the equipment of the real typesetter. Stereotype, photoengraving and picture-reception apparatus are on the second floor, and a penthouse on the roof contains the photo-developing studio.

Names and addresses of manufacturers and dealers in articles described in this magazine will be furnished by our Bureau of Information upon request accompanied by stamped, self-addressed envelope.

Charles Greenan, *Editor*, Buffalo

Passengers to Fly Atlantic in Wings of Clipper



Clipper
Cutaway view of an air leviathan designed to carry 150 passengers across the Atlantic at 350 miles an hour. Berths and observation rooms would be located in the huge wings of the eight-motored flying boat

Passenger cabins and observation rooms are located in the wings of a 150-passenger Clipper ship designed to fly from New York to London in twenty-four hours.

Structural plans for this behemoth of flying boats have been completed at the Glenn L. Martin plant in Maryland. It will weigh 250,000 pounds.

Muddle Cover

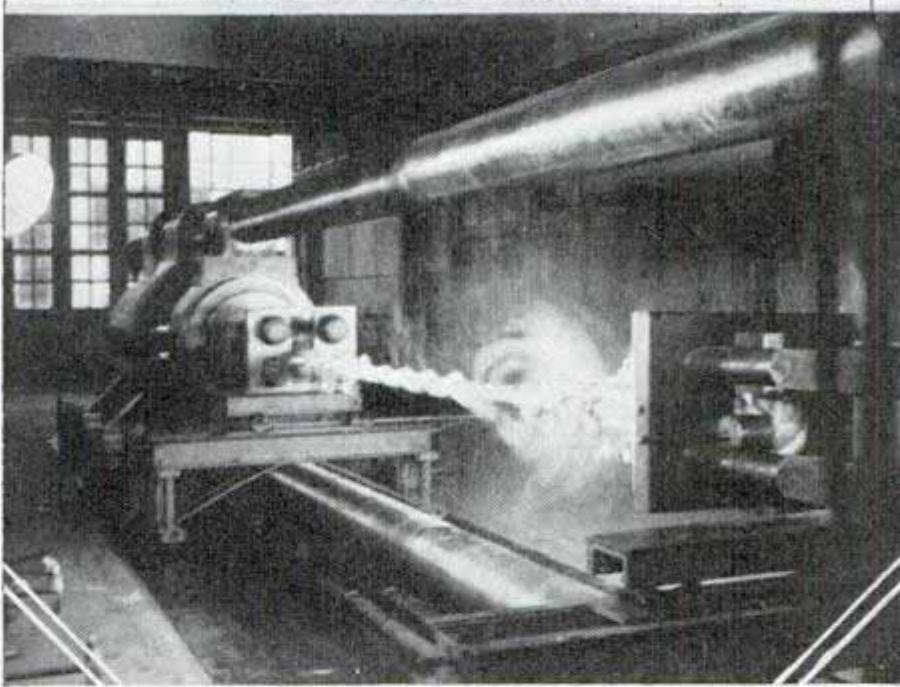
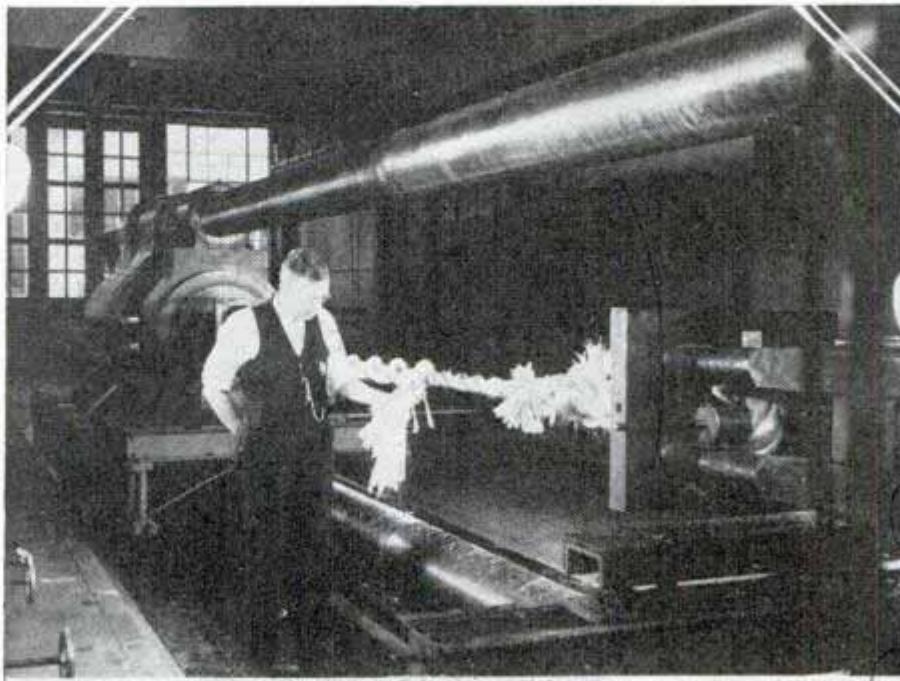
Railway Repair Truck Chases Trouble on Road or Rails



F1544
Trouble-shooting truck for electric railroad rides on rails or road

enr. Eckhardt.
Making emergency repairs to overhead power lines caused the Pennsylvania railroad a lot of trouble when some of its eastern lines were electrified because, with wires down, an electric train could not run to the scene, so a steam train had to be kept ready. The railroad now has eliminated the need for a steam repair train by using a trouble-shooting motor truck which runs on the highway or on rails. Today when an emergency arises, the truck is sent over the highway to a point near the trouble, then at a grade crossing, four railway wheels are lowered. These lift the rubber-tired road wheels clear and the truck becomes a railroad car. The

Million-Pound Pull of Jack Snaps Heavy Rope in Two



Picture at top shows rope frayed by terrific strain of testing machine. Below, the rope snaps with explosive effect under million-pound stress

truck has a front and rear wheel drive. The back truck wheels, rubber-tired, are drive wheels when the truck is on the road, but the front pair of railroad wheels do the driving when the truck is on the track. The truck is equipped with a lifting platform which can be extended several feet into the air and also carries a small power plant to furnish flood-lights for night work. The road-rail truck speeds up repair work since it can travel almost to the scene of the trouble on highways, thus eliminating the necessity for rerouting and sidetracking regular trains so the truck can get through.

T7604.

Fruit Is Kept Fresh for Six Months by Air-Gas Control

That fruits and vegetables may be kept fresh from one growing season to another is the goal of experimenters in Great Britain. Already it has been found that pears can be preserved without decay for periods up to six months, if the oxygen and carbon-dioxide content of the storage room be controlled properly. The food investigation board of the department of scientific and industrial research in that country has set up laboratories in various parts of the empire to facilitate work along this line and the progress made thus far indicates that keeping fruit fresh for long periods soon may be commercially practical.

It took a pull of a million pounds to break a thick cable rope in two, but under that stress it was snapped like a thread by the testing machine at the U. S. Bureau of Standards. The tester is a big hydraulic jack resembling a coast-defense cannon, and is capable of exerting a pull of 1,500,000 pounds. Besides testing stresses by pull, it is used to determine resistance to compression and is so delicate in operation that it can crack an egg without spilling the contents.

Our Bureau of Information will answer questions regarding articles in this magazine, if accompanied by postage.

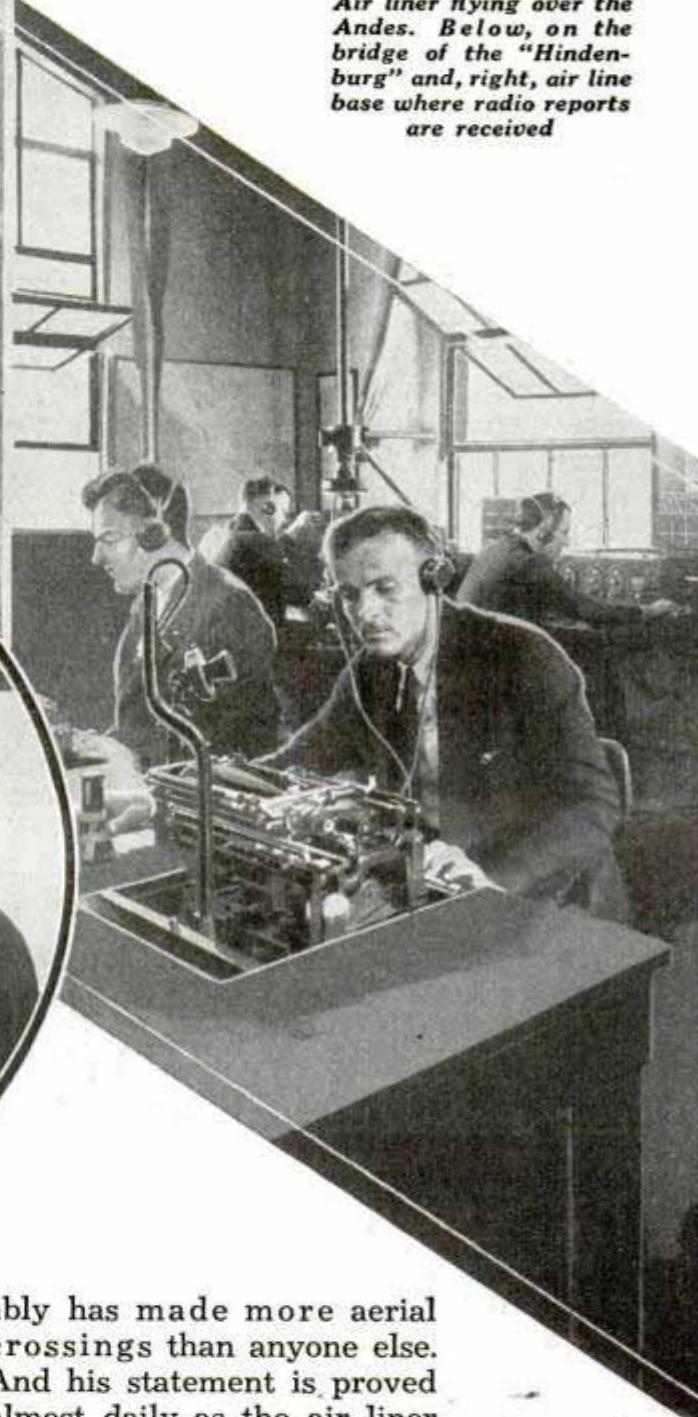
Compressed air magazine Nov. 1936

Washington and. Orioles 63. 63 roadway. 1151 Los Angeles, Calif.

1930
Pan American

AIR LINERS

Air liner flying over the Andes. Below, on the bridge of the "Hindenburg" and, right, air line base where radio reports are received



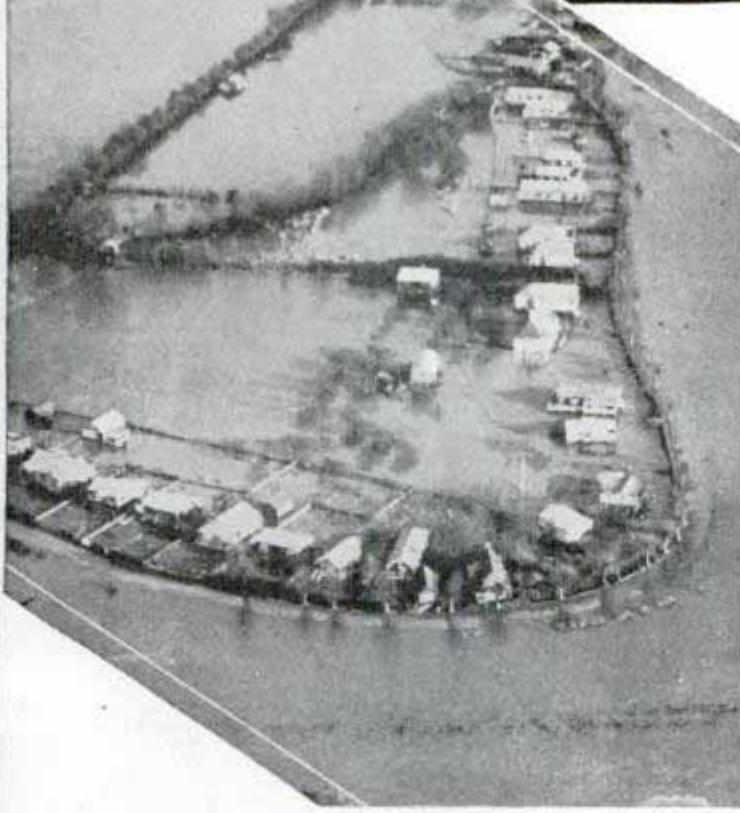
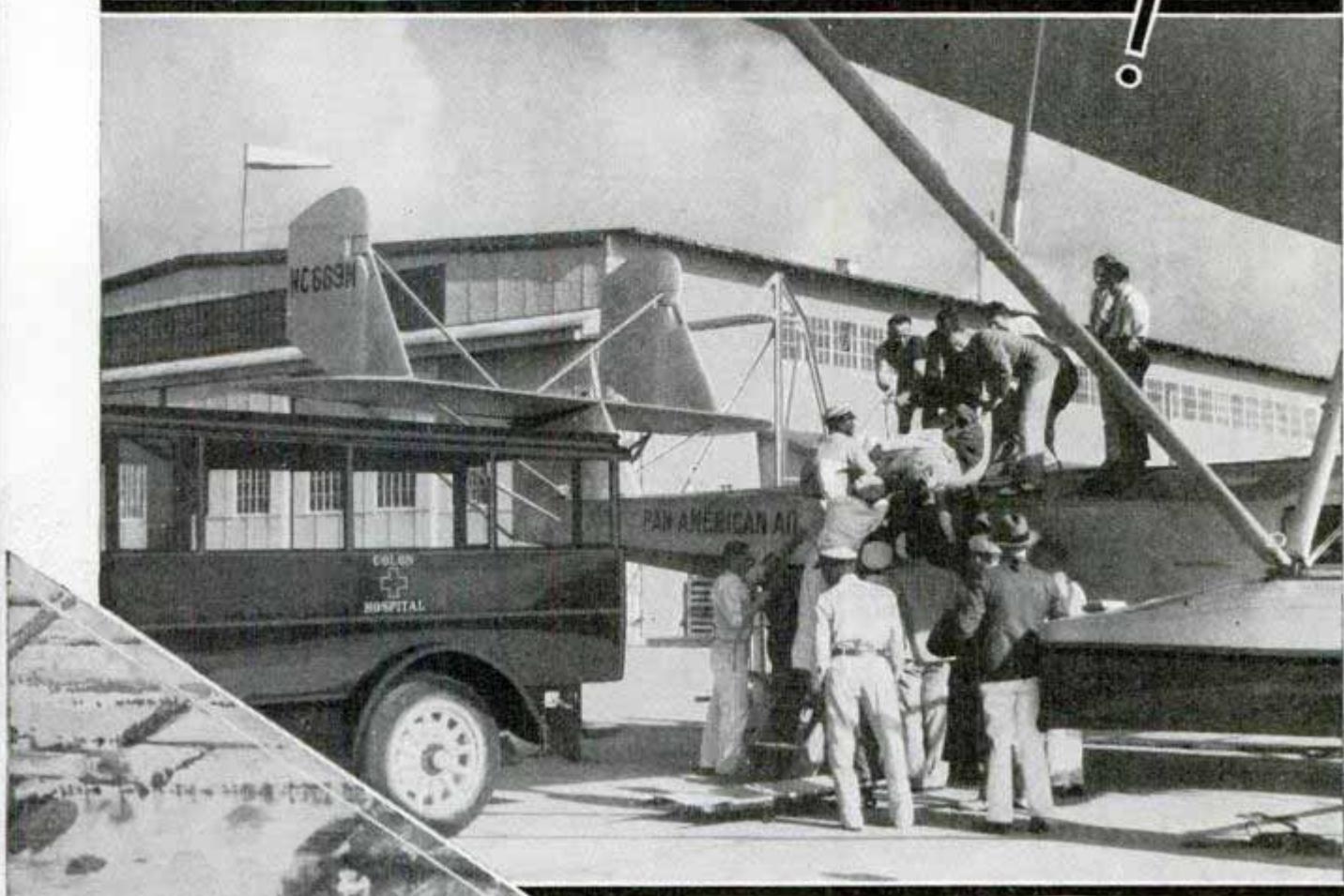
OVER land and over sea, wherever men fly the commercial air lanes today, they have written a new chapter in the traditional rescue code of the sea. The pilot of the air liner is a scientific skipper of the air. Science has given him the equipment to help in the saving of human lives and the mercantile and naval vessels in which many pilots at one time have served, have given him the tradition. Today the SOS call brings help faster and more efficiently than ever before."

Thus declares Dr. Hugo Eckener, veteran commander of the "Graf Zeppelin" and the "Hindenburg," the man who prob-

ably has made more aerial crossings than anyone else. And his statement is proved almost daily as the air-liner pilot writes a new chapter in the heroic annals of aviation. Whether it be the skipper of the giant lighter-than-air liner droning across the Atlantic, the pilot of the "China Clipper," winging his way across the still wider Pacific, or one of the pilots of a transport plane making a shorter flight over land, he is not only quick to respond to an SOS but through his alertness and keen observation he frequently supplies aid from the air and pre-

Capt. Ernkle C.
Schnurnacher
727 Park Ave New York
F1366

to the RESCUE!



Top, delivering pilot rescued from jungle to waiting ambulance. Below, planes help in surveying flood areas such as this

vents loss of life even before aid has been summoned.

Flying over New Jersey, the skipper of a TWA transport notices a house on fire. He dives and the noise of his powerful motors is loud enough to wake the occupants of the house and enable them to save themselves before being overcome by the smoke and flames.

Flying a Pan American Clipper up the Brazilian coast, the senior pilot observes a small trawler being helplessly pounded to pieces on the rocky shore. Quickly the radio operator communicates with the base airport at Rio de Janeiro. And just as quickly the radio operator at the base summons aid for the disabled vessel.

In far off Haichow, China, an American girl is dying of a rare disease. Only a prompt injection of a serum can save her and the nearest supply is in a hospital in Shanghai. The Chinese National Aviation Corporation—an American air line operated in conjunction with the Chinese government—is notified and soon an Ameri-



havasupai
Top, pilots often drop food from the sky to snowbound Indians. Right, elevator wheelman on bridge of "Hindenburg." Below, good visibility aids rescue work



can pilot is winging his way toward Hainan with the serum.

And so it goes almost daily in every part of the world as air liners speed to the rescue. The air-line operators prefer to carry on this work as secretly as possible and it is only occasionally, in some major catastrophe or some unusually heroic flight, that the rescue from the air is brought to the attention of the public.

"There is a good reason for this secrecy,"

states a TWA official. "The modern air line takes pride in the routine efficiency of its flights and aviation has progressed to the point where the flights have become routine, as has the pilot's response to a call for aid."

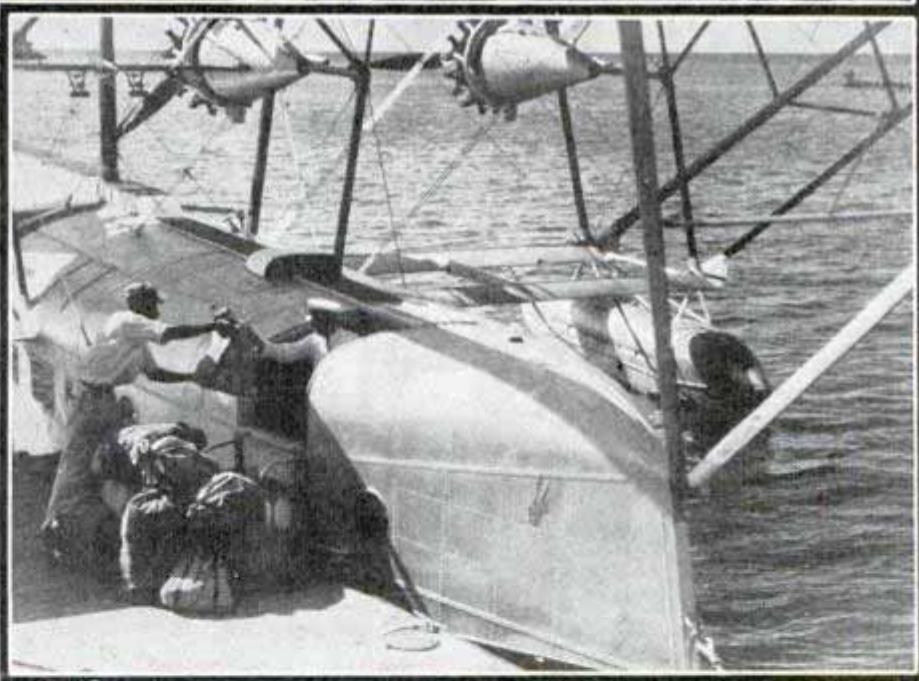
Because of this, many heroic rescues are known to few people outside of



the actual participants. The instrumental work which the "Graf Zeppelin" did in locating the stranded crew of a Lufthansa airplane adrift on the South Atlantic, the dropping of food supplies to snowbound Indians by TWA pilots and many

similar exploits have passed unchronicled, regarded by all concerned as just part of the day's work.

The actual groundwork for aerial rescue was laid eight years ago when Pan American Airways built a network of forty-seven weather reporting and radio stations at various points around the Caribbean sea, breeding ground of many hurricanes. Hourly reports on the progress and course of hurricanes were gathered by these sta-



Air liner flying over mountainous country and, below, delivering serum which may save a human life

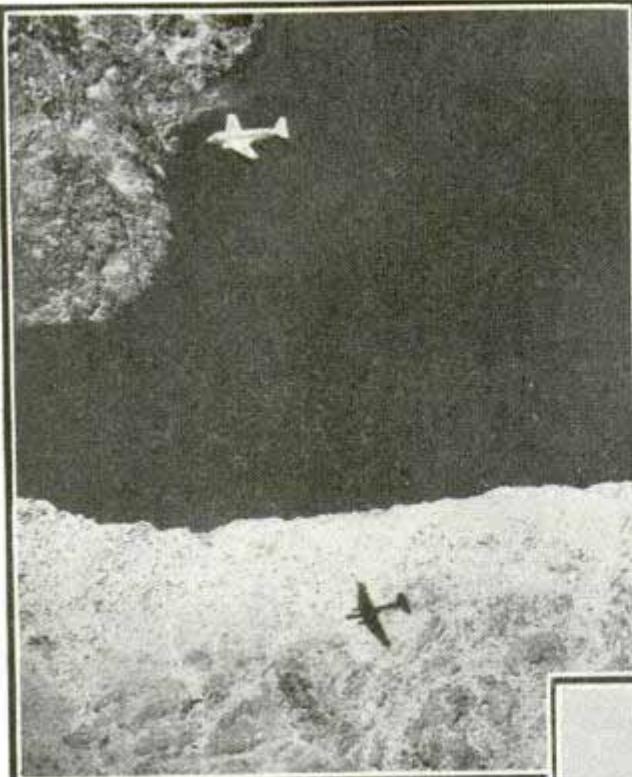
tions and radioed to weather bureau stations at Miami and San Juan, Porto Rico, where they were in turn radioed to ships at sea. By these timely warnings, since the inception of the service, it is estimated that more than 26,000 lives have been saved.

A few years ago when a hurricane roared over Porto Rico, killing 200 and injuring 1,000, due to the advance notice given by the aviation radio stations, preparations for relief work were being made even before the gale struck the island. The warning broadcasts also enabled ships at sea as well as people on land to take precautions for their safety. By 1931, the air liners themselves were taking an active part in rescue work. It was in the spring of that year that an earthquake rocked Managua, Nicaragua, and help from the skies became an actuality.

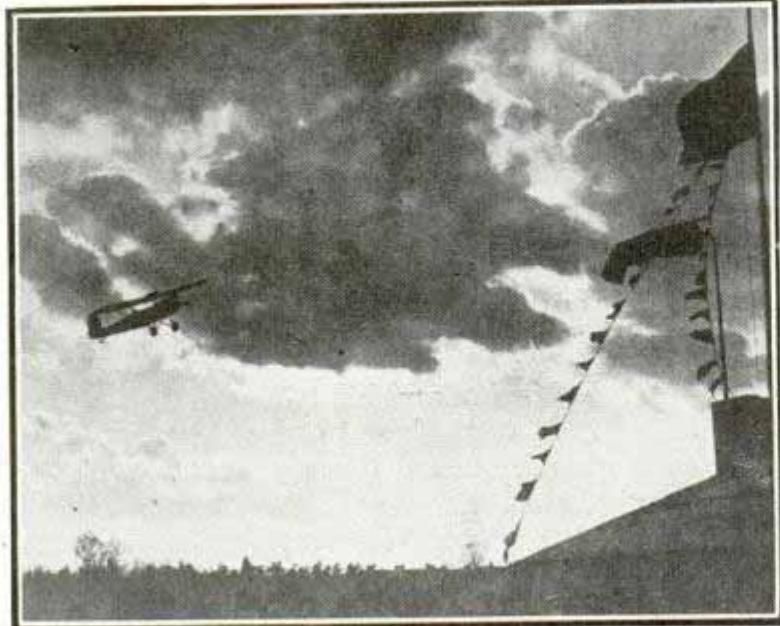
Immediately after the earthquake, Pilot

N. F. Varian and his trimotor Pan American Airways plane in near-by San Salvador took aboard doctors, water, food and medicinal supplies, flew over Nicaragua on this errand of mercy and, at the same time, radioed back the first full report of the devastation caused in the stricken city.

"8.03 a.m.—over Managua—city completely demolished," he radioed. "Fire raging over large portions.



"Later—have been through city. Catastrophe beyond description. 600 known dead—expected to reach 1,000. Thousands injured. No water. People walking around in daze looking for bodies of loved ones. American legation in ruins. Hundreds killed in penitentiary and hospitals. Marines doing wonderful work. City to be evacuated this afternoon. Bodies burned for lack of burial facilities."



Flying high above the ground or water below him, the pilot is in a position to spot trouble quickly and summon aid by radio

Since that time the aerial help which the air liners have rendered in earthquakes, floods, hurricanes and other disasters has extended to nearly every continent.

"While the construction of an air liner has not as yet made it possible to descend upon the surface of a raging sea to effect a rescue, nevertheless the pilot may perform valuable work in helping to locate a disabled vessel and direct the rescue work," states Dr. Eckener.

"Because of the superior speed of aircraft over seagoing vessels and because of the aerial vantage point, an air liner may spot a small craft which might conceivably go unnoticed by a ship speeding to the rescue. Since the transoceanic air liner of



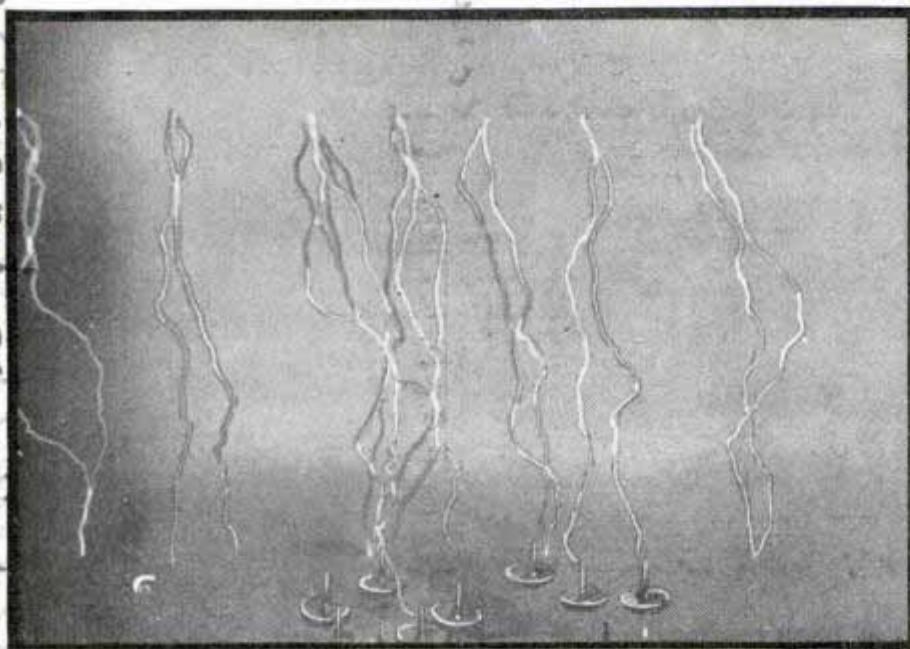
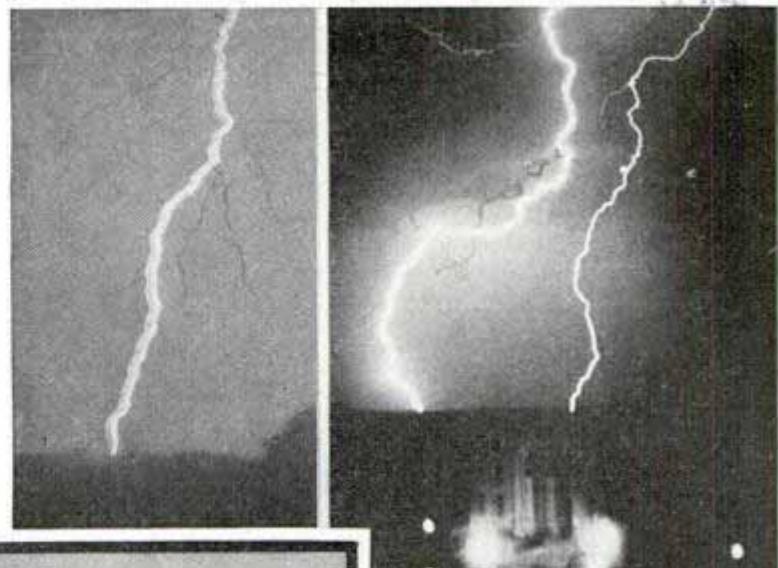
the future, whether heavier than air or lighter than air, undoubtedly will fly over the regular steamship lanes, this is an added measure of safety to vessels, especially to small craft unable to reach other ships with a radio SOS."

Over land, too, the same help from the skies is now given. Last year nearly all of the commercial lines aided in flying over the territory inundated by the spring floods, surveying the extent of the damage, bringing first-aid equipment and medical aid. Recently in Argentina when the waters of

(Continued to page 116A)

Photographs Solve 'Dark Lightning' Mystery

Dark branches streaking off from white lightning mystified photographers for years. Open your camera shutter at "time" during an electrical storm, leave it exposed for two or three lightning strokes and you may find several "black lightning" lines in your picture. J. C. Jensen of Nebraska Wesleyan University obtained similar effects in photographs of natural lightning and of laboratory lightning produced with a static machine. Branches



Notice "black lightning" in photographs above. At left, similar effect obtained in laboratory with artificial lightning

sufficient to cause a second reversal. Mr. Jensen theorized that silver salts energized normally produce a black image, but excess energy reverses the image and under very intense light a second reversal is possible.

716 33

Matches Light When Pulled from Handy Ash Tray

For the convenience of the smoker, a combination ash tray and match holder carries in its circular top a supply of matches which light when they are pulled out of the holder. The matches come in rolls which fit the top of the holder, each match head being individually inclosed. Match roll refills for the ash tray are available and are easy to attach.

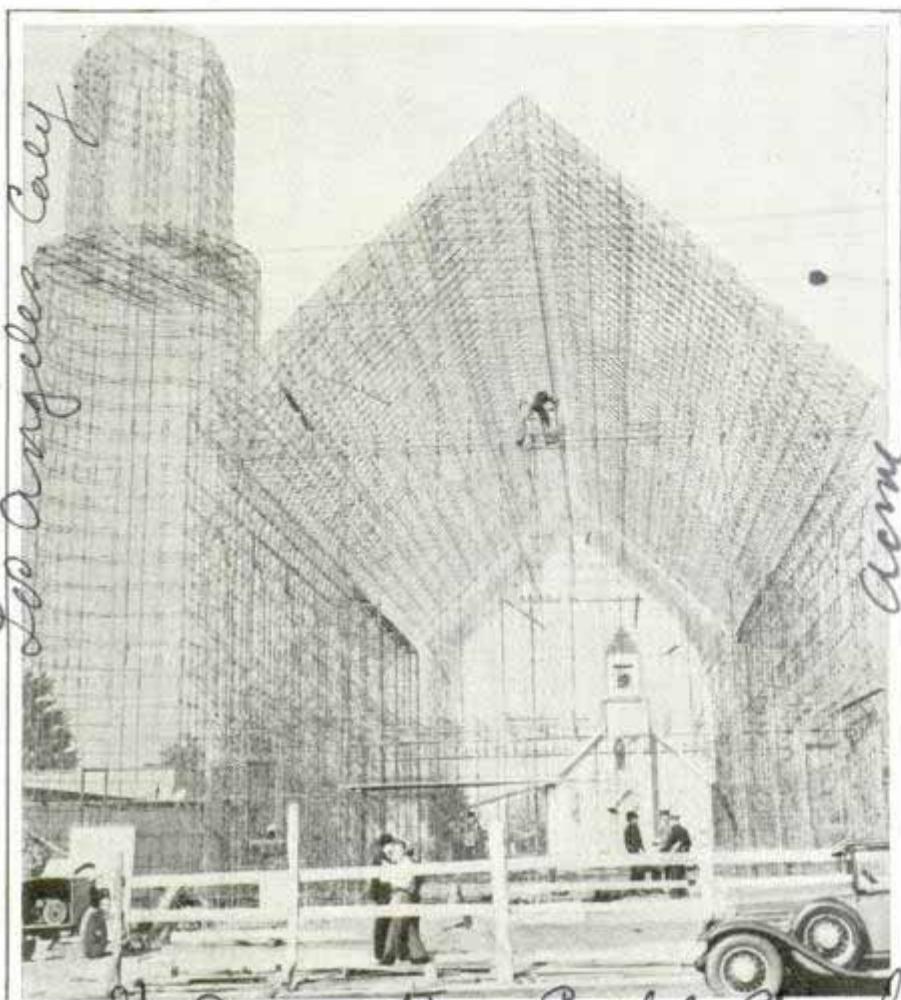


American Pullmatch

of the first stroke reversed themselves and turned dark when the camera caught a second brilliant stroke in the sky, and where the branch approached the main path of the original discharge, it appeared white with a black margin. Had the shutter been closed immediately after the first discharge, main path and branches would have remained white. In the laboratory, one pole of the static machine was connected to a sheet of tin covered with upturned thumbtacks; the other pole was joined to a wire discharge point. After taking a succession of artificial lightning pictures, room lights were turned on and diffused light allowed to strike the lens for fifteen seconds. This caused reversals, the discharges appearing to have black margins. Where discharge paths crossed each other the energy incident on the plate was

Web of Welded Steel Rods

Forms Church Framework



Framework of church at Culver City, Calif., built of steel rods woven into twelve by twenty foot panels and welded into a unit

Small steel rods interwoven and welded into a single unit form the framework of a church in Culver City, Calif., built on a new construction plan. Joints are formed by wrapping one member around another. Twelve by twenty foot panels were fabricated by a steel company and delivered to the building site ready to be set in place. When completed the church is to be resistant to fire, termites and earthquake.

Four-Motored Transport Plane Could Span America in Night

Aeronautical experts see as the next step in air travel a twenty-passenger transport plane that could cross the United States overnight at 225 miles an hour. Specifications for this air leviathan call for a low-winged monoplane twice the size of

the passenger ships in use today, equipped with four motors developing three times the horsepower of the current sky liners. It would have a 1,250-mile non-stop cruising range.

F1502

New Clothes Drier Eases the Work of Wash Day

Heat and motion are combined in a clothes drier which makes wash day easier in the home. The heat is provided by electricity or gas flame. The clothes are wrung after washing, and placed in a drum which makes a complete revolution every second. The motor which turns the drum also drives a blower which removes the moist air. About thirty-five pounds of wet clothes can be handled in the three-foot drum at one time. Costs of operation are low and the time required for drying is much less than when clothes are hung out.



Opening drum of clothes drier to remove garments.
The machine saves time

United Aircraft Corp

Lights of Giant Bridge Create Night Spectacle



clu
Two views of brilliant illumination of bay bridge. In top picture note pattern of light formed by beams of warships' searchlights

Thousands of bright lights transform the giant San Francisco-Oakland bay bridge into a glittering spectacle at night. From one end to the other, the structure is literally ablaze with the illumination from a myriad electric lamps of various sizes and power. Traffic is able to move with daylight speed, so efficient is the lighting system. On the opening night, photographers found the big bridge a scene well worth recording and a number of unusual pictures resulted. One shows the bridge, with its scores of lights, against a background of high-candlepower illumination from the searchlights of battleships. The pointing fingers of light from the ships painted patterns on the dark sky, changing as the operators turned the searchlights in every direction. Another photograph shows the bridge and its thick traffic as viewed from Yerba Buena island.



F1581 Gas Explosion Is Used to Pump Liquid Manure into Tank

Liquids can be loaded into tanks in double-quick time by harnessing the vacuum produced by a gasoline explosion. This method is used to fill liquid-manure tanks on German farms and could also be applied to the removal of water from flooded

cellars. The explosion of gasoline in a secondary tank causes an outrush of air through a large valve which is closed quickly after the blast. The resulting vacuum draws the liquid from its vat into the tank through hose fitted with check valves.

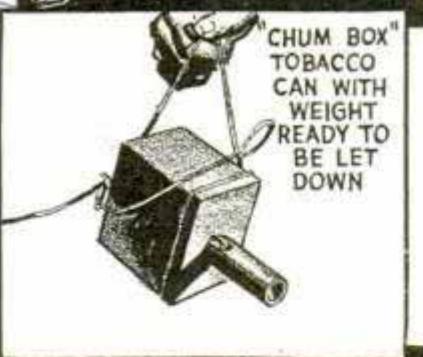
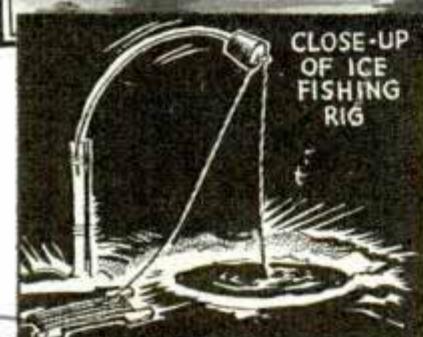
Reported by A. B. Gray, Sept. 4

Von Lengenhe & Antine, 335 Wabash
Flight Marshall Field & Co., Chicago

Flight Marshall Field & Co., Chicago

FISHING Through

spotting goods stores



Top, a nice black bass that hit a live minnow under the ice. Below, a simple ice fishing rig, chum box used for cisco fishing and a cisco tackle outfit employing colored beads for bait to attract the fish under the ice

By Bob Becker

ALTHOUGH thousands of fishermen put up their tackle when cold weather comes there are plenty of chances to catch fish when streams and lakes are frozen over. Contrary to the ideas of many fishermen, fresh-water fish such as perch, walleyed pike, crappies, ciscos, bluegills, lake trout and even bass will take a lure in the heart of winter. If you don't mind the cold and have the right kind of outfit you can have a lot of fun working your tackle during the winter months.

Before you assemble your outfit look up your state laws on ice fishing because the regulations vary. For example, some states permit the construction of huts on the ice so you can keep under shelter and fish quite comfortably, while others do not permit the use of shanties or shacks. So check on your laws and the question of a license.

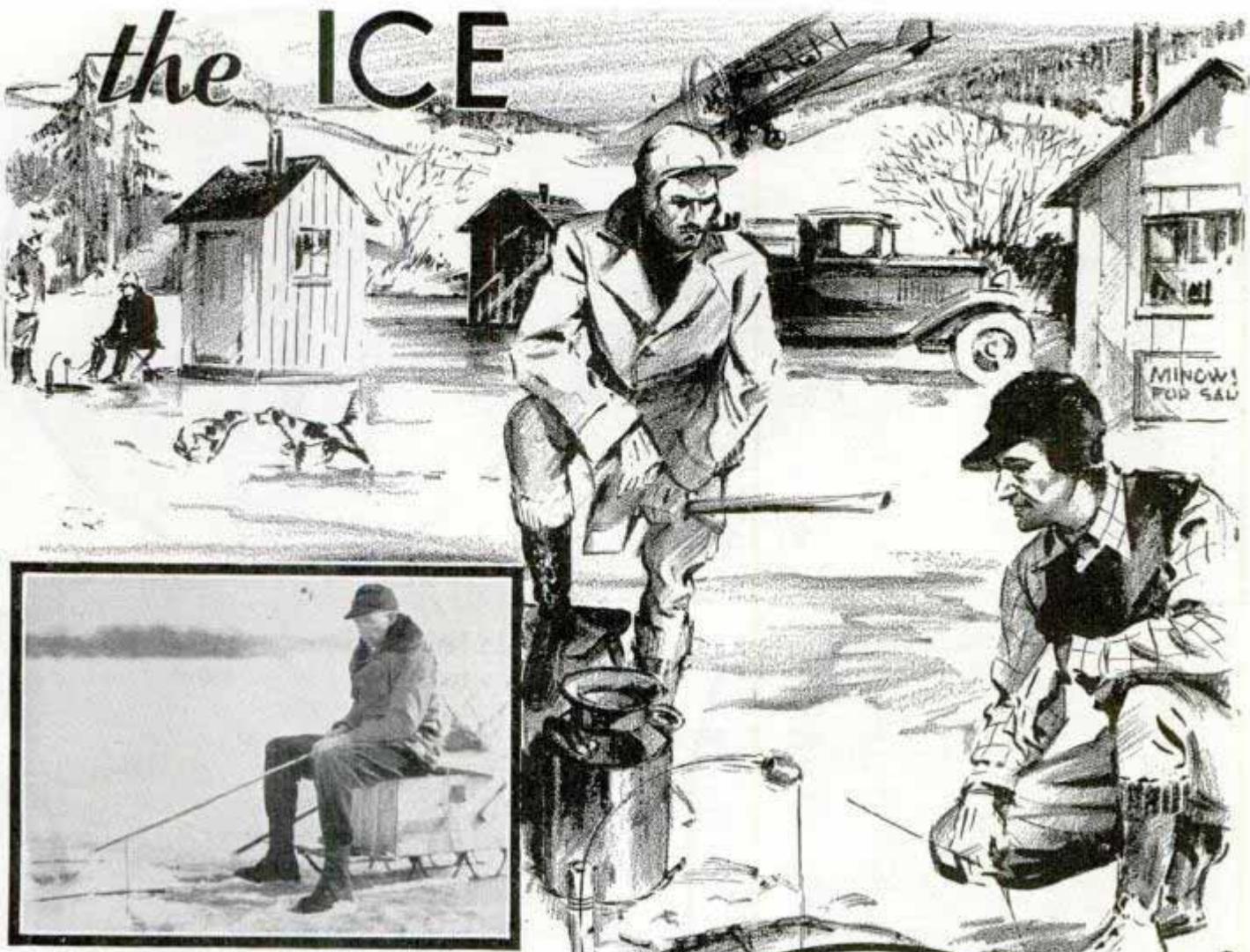
For ice fishing you will need something to cut a hole in the ice. Many use two instruments, a small ax and a sharp-pointed crowbar. If the ice is only a few inches thick an ax will do. When it is thicker a long steel "hole digger" may be necessary.

Fishing tackle can be simple and inexpensive. You do not need rods and reels. Many fishermen use just a short cane pole about five feet long to which is tied seven or eight feet of strong line. A cork is put on the line so it will float in the hole. The boys simply lay these poles flat on the ice with the hook and bait dropped through the open fishing hole. This is about the simplest outfit you can assemble.

You also need hooks of various sizes and plenty of

of Sport
Dept. Chicago Tribune

the ICE



bait. If you're using minnows, a bucket is required. Crappies, bluegills, bass, pickerel and similar species usually bite best on small minnows. To carry a good supply of minnows, poles, ice-chopping tools, lunch, maybe a Thermos of hot coffee and other supplies there is nothing like a sled. This sled also serves as a seat.

Although it's fun to fish with short cane poles and bobbers many like the outfit that calls for the use of a signal bobber above the surface. Fishermen use these especially if they have a sizable string of lines at work. Most boys make these outfits at home. First, you need short pieces of wood twelve to sixteen inches long. These are inserted into the ice close to the



Above, left, ice fisherman using his sled for a seat. He also uses the sled to haul all his equipment to the scene and take it home again. Below, an ice fisherman proving by this string of pickerel, crappies and bass that the fish really do bite in winter if you know how to attract them



Top, ice fisherman with one day's catch and, right, cutting hole in ice. Below, ice fishing shack

edge of the fishing hole. In the top of such a piece of wood or bound to the side is a short piece of resilient wire or flat steel ribbon, one-fourth inch wide. They're strong and whippy. At the end of this wire where it arches over the fishing hole place a cork and also attach your line. Tie a piece of red cloth or yarn here to catch the eye.

You coil up slack line not being used on the ice next to the hole. When a fish hits this outfit it bends the wire down and the action of the fish working on the minnow and swimming around also makes it dip and bob so you can see a strike quickly. The end of the line is, of course, tied to the stake in the ice. The fisherman who,

under state laws, can put up a shanty on the ice also needs a little oil stove.

When fishing for crappies, bluegills, perch, pickerel and other species usually found in an inland lake, the experienced fishermen make a beeline for a location over a weed bed or bar. Just as the crappies and pickerel and bluegills frequent a weedy area during the summer, so they like to spend their time around such a spot during the winter. Black bass also can be found around a weed bed. So the ice fisherman should know something about his lake before he starts to chop ice.

Some fishermen having heard about the deep water in which, for example, lake trout in the big lakes are caught, are apt to believe they must go way down to the bottom to get fish in winter. Such is not the case. You may need to let down not more than five feet of line to hook them. The size of the hole in the ice may vary. For example, some fishermen cut a hole not more than fourteen or fifteen inches wide. Others make them twenty to twenty-four inches. In the final analysis the hole should be just big enough to facilitate the landing of a fish. It's work cutting holes so why excavate larger openings than needed.

For bait use minnows for bass, pickerel, crappies, perch, and walleyed pike, herring for lake trout and colored beads for ciscos. Worms also make an excellent bait, if you can get them. But for all-around fishing the minnow is preferred. Cisco fishing, calling for the use of beads and a



hook, is one of the most interesting tricks of winter fishing. The cisco is a lake herring, closely related to the whitefish. When you fish for these slim, pearly colored fish, you may have to go down deep for them, so go with plenty of line. You also will need very tiny hooks, heavy sinkers, and a handful of blue, red, pink, and white beads. There are times when you may have to fish in fifty or sixty feet of water and others when you can get the delicious ciscos in twelve feet. Again you may lure them within four feet of the surface. It all depends on how the schools are working.

The comfortable way to fish for the cisco is to use a small wooden shanty on runners so it can be moved from one location to another. Then get an oil stove, implements to cut holes through the ice and at least four lines with sinkers, hooks, and beads on the hooks. Locate your shanty and cut two holes in the ice, one on each side of the shanty. You'll need two old chairs, and a small tin can that you can put on top of the stove to cook up the "chum" also is an asset. Then rig up a small metal box and line so you can drop the chum into deep water. A small net to catch minnows to make the chum also is needed. By "chumming" ciscos is meant putting chopped-up minnows in the water below the fishing holes so the ciscos will come around, feed on these tidbits, linger awhile and eventually hit the bead lure.

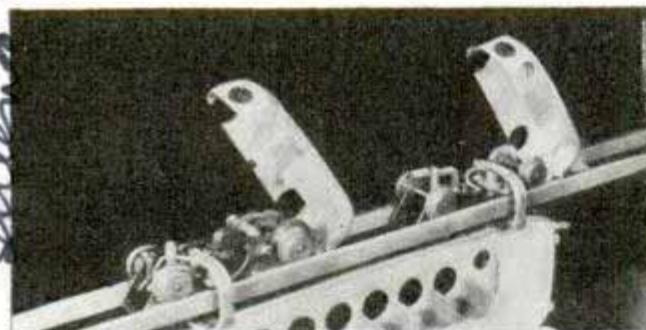
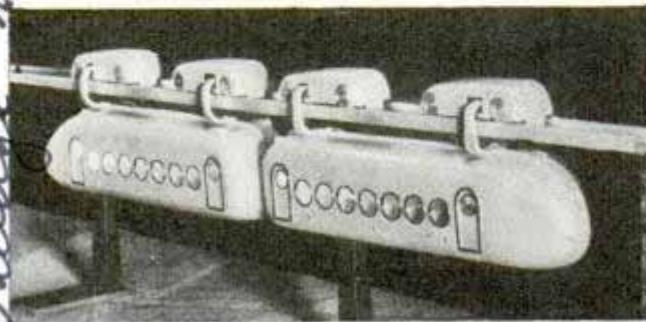
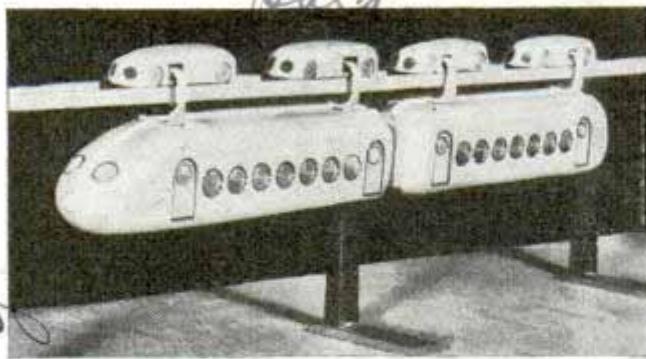
Fishermen use two different systems.

(Continued to page 122A)

Top, baiting hook, and pickerel taken through ice. Center, ice fishing shack. Bottom, two sticks and a coat make a windbreak

F1522.

Toy Train on Suspension Track Cannot Be Derailed



Three views of suspension toy train. Bottom, power trucks exposed for servicing

Running on a suspension-type track, the latest streamline toy train attains speeds unusual in such devices, being able to travel as fast on curves as on straightaways. Yet it cannot fall off the track, since the wheels are on top of the track and the car beneath. The cars can be opened for children to give their other toys a ride and the wheel trucks can be exposed for repairs. The train is electrically operated by transformer. Metal uprights support the track, keeping the train off the floor and helping to prevent damage to furniture.

Law. Joseph Cambalik 2/12-06 1 Hillside Ave
Bellona Village 2/12-06 1 Hillside Ave
Chevy Chase 2/12-06 1 Hillside Ave
F. M. Products Co. 4/7 30 Flynnme

F1522. **Repair Cement Sets Quickly
and Holds Nail or Screw**

Waterproof, fireproof and a non-conductor, a dry powder cement now on the market will set in an hour's time after

being used to repair cracked laundry tubs, water pipes, washing machines, radiators, and tile. It may be used to set bolts, lags, screws and nails in wall or floor, holding them so firmly that they cannot be removed. If desired, screws may be prepared for removing from the cement by coating them with oil, grease or vaseline. The makers claim that the cement does not shrink and that it sets as hard as stone. The powder is mixed with water to form a thick paste which is easily applied.

F1567

Illuminated Magnifying Glass Combined with Flashlight

Serving as an ordinary pocket lamp for casual seeing, a small metal flashlight can be converted into an illuminated magnifying glass for close visual work. The lens is contained in a clip which slides over the battery case when the lamp is used as a flashlight. When this clip is removed and placed in channels at right angles to the case, the user has a magnifying glass, and turning on the light illuminates the field under it. The double convex lens has a focal length of about two inches.



Flashlight, below, becomes illuminated magnifying glass, above, when lens is removed from battery case

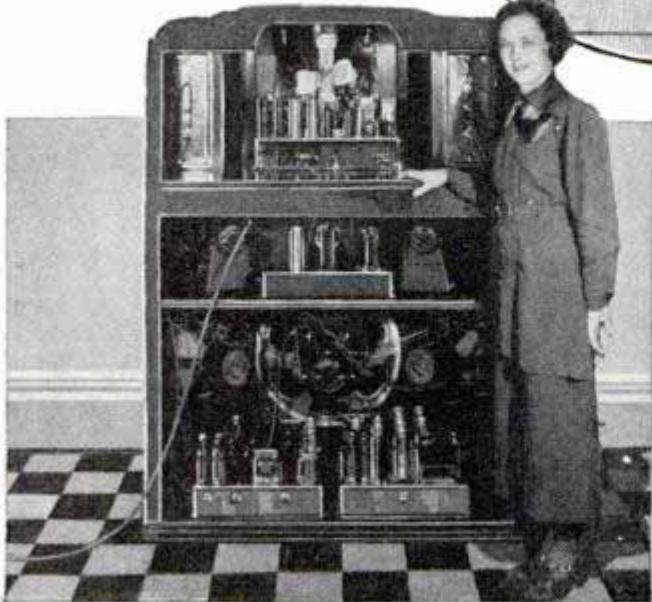
The Hot Dog Company

RA DIO...

Thirty-Seven-Tube RECEIVER

HOW would you like to tune a 37-tube all-wave receiver that is equipped with a dial 12 in. in diameter and employs six loudspeakers? This giant console receiver weighs 475 pounds, it stands 4 ft. 10 in. high, is 42 in. wide and 22 in. deep.

Suitable for use in auditoriums, large homes and restaurants, it receives the entire range of music; has continuous coverage from 540 kc. to 18,300 kc. and the power output is said to be from 50 to 75 watts. Four chassis bases are required for the arrangement of the equipment as will be noted in the lower photo. All tubes are

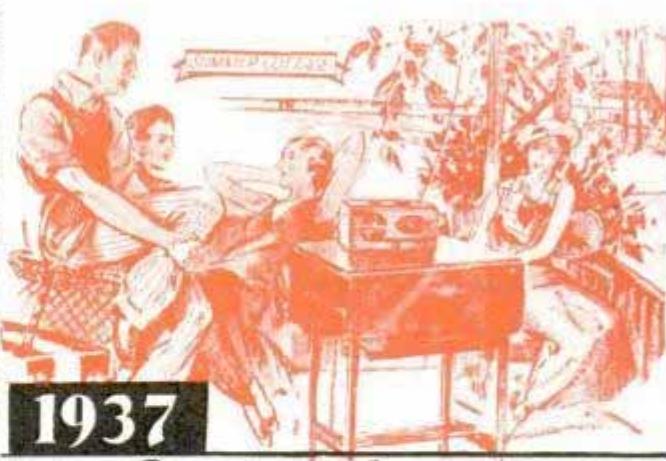
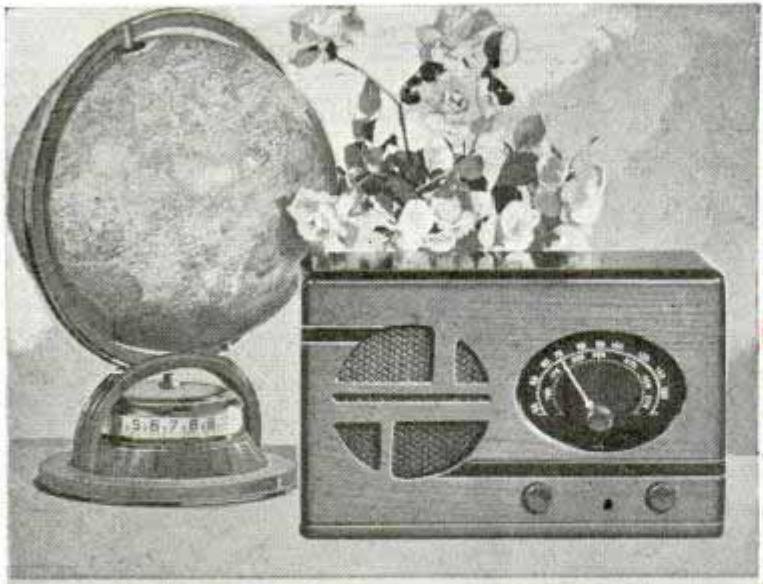


metal with the exception of the one for the tuning light and the auto-expressionator circuit. Other outstanding features include: base compensation; "mystic hand" automatic tuning; six-step tone control, in addition to volume

control for each different audio range—bass, mezzo and treble. In addition to the radio receiver proper, it is provided with a public-address system which has separate controls of its own. The young lady with the "mike" in the center photo is demonstrating this feature in a large auditorium.

One of the six speakers is 18 in. in diameter; this is used for the bass, or low frequencies, down to the lowest notes of a pipe organ. Two 12-in. speakers cover the middle musical scale and three smaller high-frequency diaphragm types receive the higher notes and overtones.

Crosley Radio Corp.
1329 Arlington



1937

Little Giant A.C.-D.C. Receiver.

By Frank M. Lund

THIS improved model of the most popular portable a.c.-d.c. receiver ever described in Popular Mechanics Magazine, now has twice the output of the original set which was first-prize winner at a set-building contest held by the Hawthorne radio club, an employes organization of the Western Electric company. There are several good reasons for the popularity of this particular circuit; it makes an excellent general-purpose midget receiver that is easy to build, has distance-getting ability, fine tone and surprising volume.

The parts are carefully selected but not expensive and this new model has several advanced features that are well worth while. Operating on 110 volts, either a.c. or d.c., the line supply may be anything

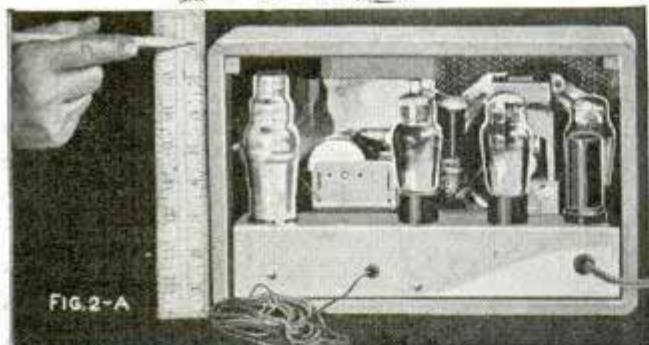
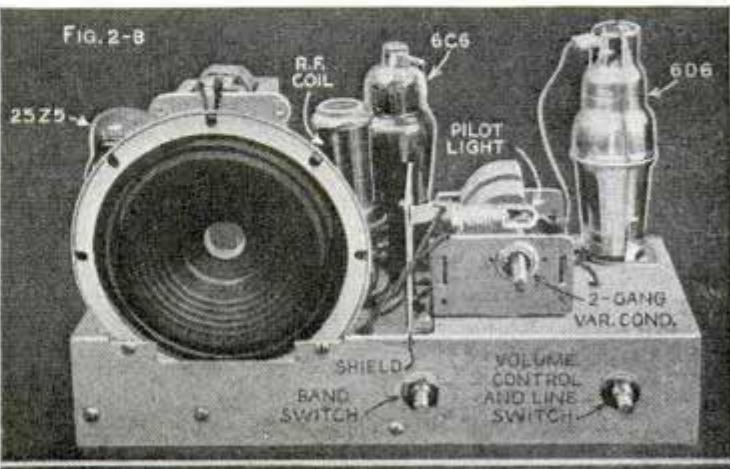


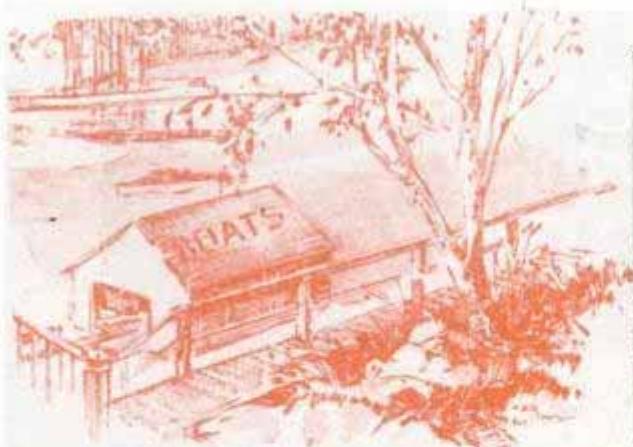
FIG. 2-A



Fig. 2-B



418

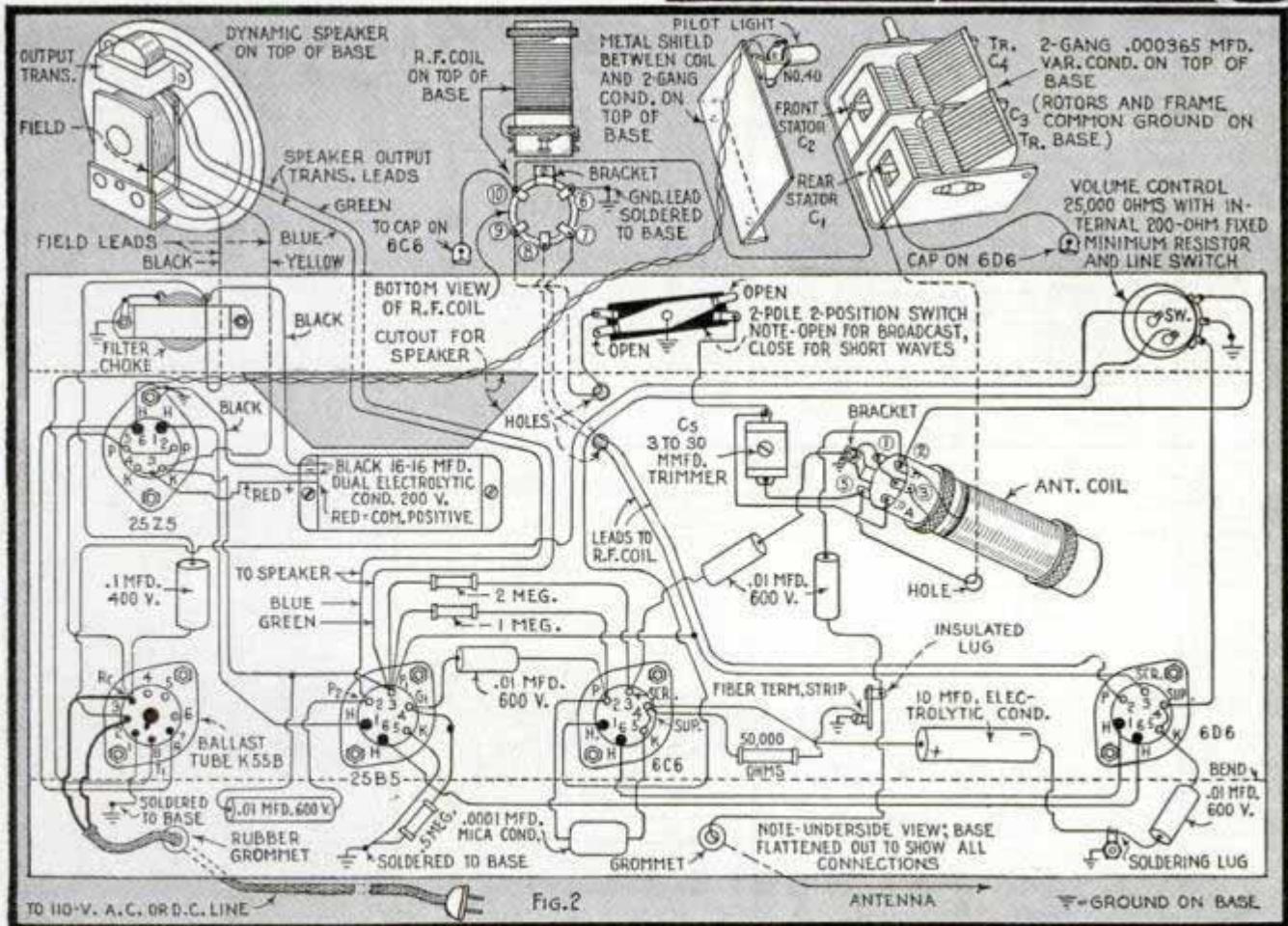
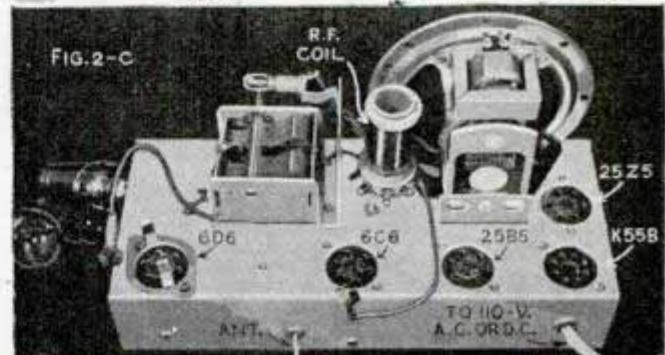


PORTABLE

*Tunes from
70 to 550
Meters*

from 25 to 60 cycles, which is of interest to many Canadian readers. A resistance, or "ballast," tube eliminates the necessity for using resistance wire in the line cord.

(Continued to page 146A)





Tune in Records on your RECEIVER

ONLY a few inexpensive parts are required to build this self-powered phono-radio oscillator which will enable anyone to properly reproduce phonograph records through an ordinary radio receiver. It operates like a miniature transmitting station, being modulated with the output of the phonograph pick-up. Usually a single insulated wire from one of the jacks marked "to radio" with a few turns loosely wrapped around the antenna lead-in near your set will give sufficient signal input to your receiver. A magnetic phonograph pick-up arm is

then connected to the input jacks and the receiver is tuned to a point on the dial where no broadcasting station is heard. The final step is to adjust the small padding condenser (C_1) with a screwdriver until the oscillator is operating on the same frequency that the receiver is tuned to. Any experimenter can build this simple unit with a few tools.

Working directly from the 110-volt a.c. or d.c. line independent of the receiver, no internal connection to, or change in, the

(Continued to page 126A)

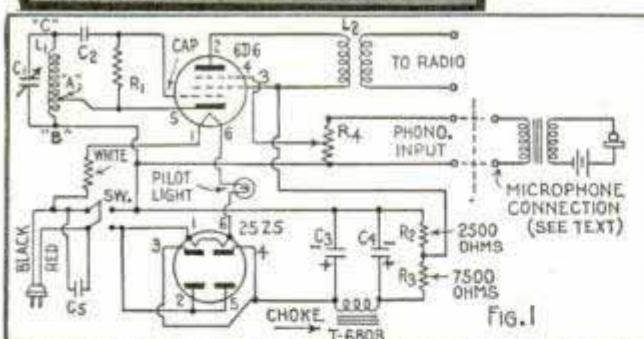


FIG. 1

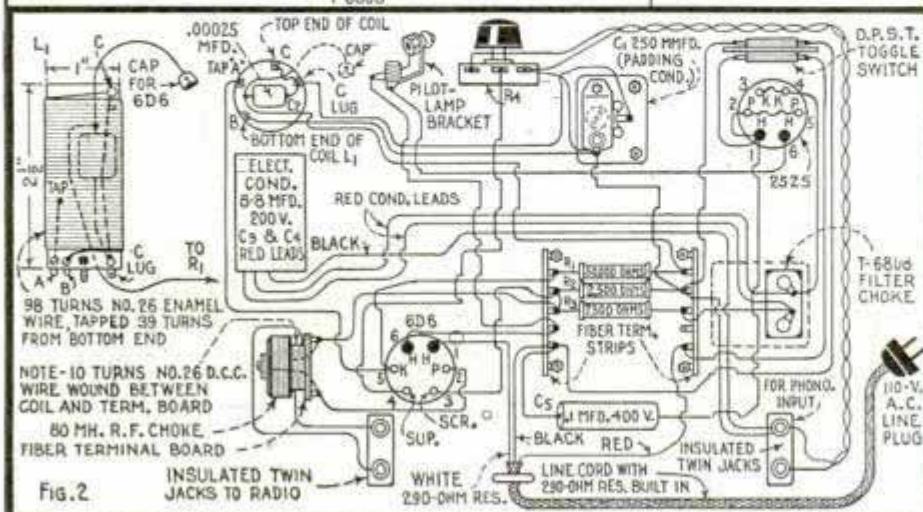


FIG. 2

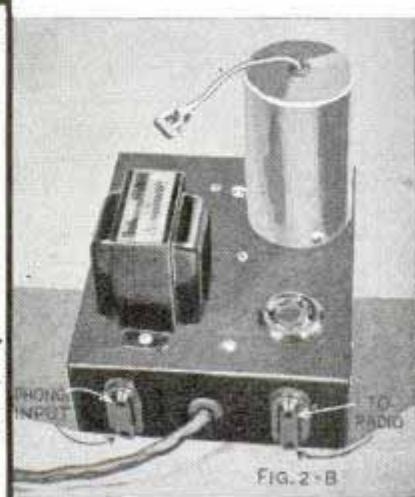
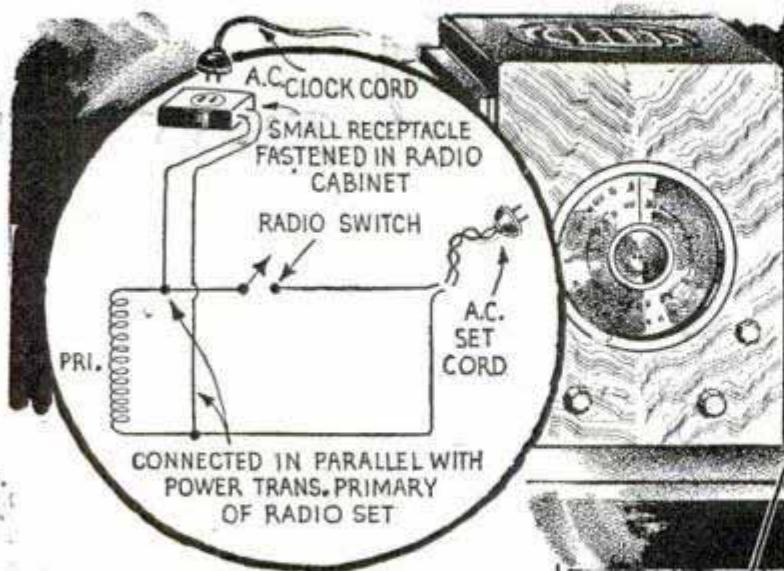
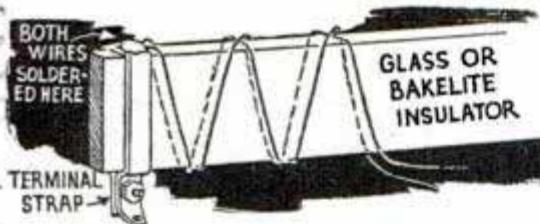


FIG. 2-B

Easy Solutions for Everyday Radio Problems



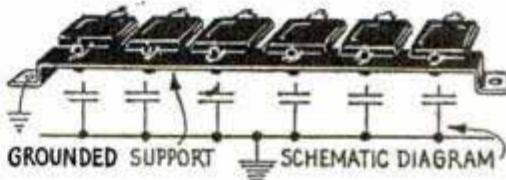
Above, hook-up for connecting a small electric clock of the "self-starting" variety to act as a timer to determine how much your receiver is used during any 12-hour period. Set hour and minute hands at 12 o'clock. Clock will record time only when set is turned on



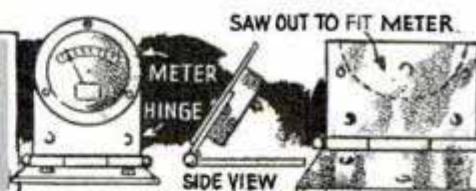
Above, experimental non-inductive wire-wound resistor. A double winding of resistance wire is placed on a glass or Bakelite strip in the manner shown in the sketch. The wires are wound in opposite directions around the form and soldered to the brass terminal strips at each end. Right, electron-eye tuning unit easily installed in any set. Cutaway view shows back of panel assembly



Left, telescopic pole-type antenna mounts on sill or window sash. Its extended length is 8 feet



Above, metal strip for grounding several fixed condensers at a common point



Square door hinge makes adjustable meter support. A tight hinge permits changing angle for convenient reading. This idea and the one above apply to breadboard layouts

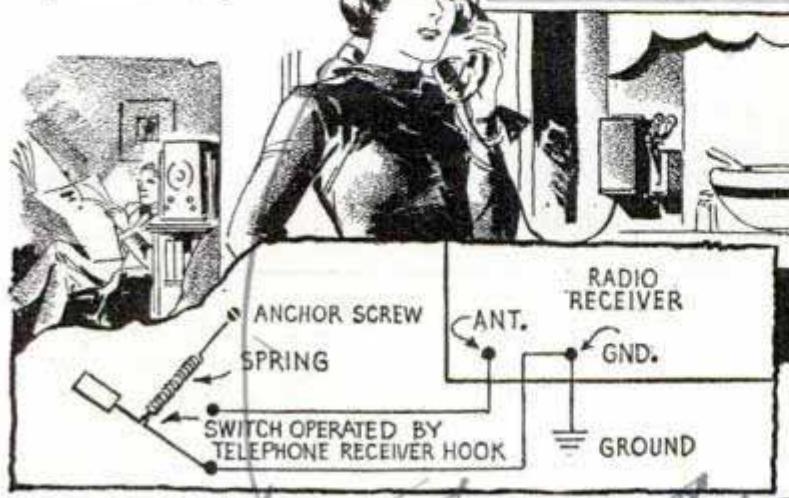


Photo above and diagram at left show how to connect auto stoplight switch on telephone to cut out set when phone is used

July 1936 \$1.50
Technical Application Page 178 16th

John Deutchman
Concord, Mass.

F 3640

End-Table Radio Receiver



Three-band super in end-table cabinet

Available in six and ten-tube super models, this modern end-table receiver is built for domestic broadcasts, short-wave and foreign reception. Placed alongside an arm chair, divan or day bed it is convenient to tune. A plate-glass panel protects the dial and slides out of sight when set is in operation. A hinged top covers a utility compartment in the rear which provides storage space for your log and magazines. Provision has been made for an all-wave doublet antenna connection and the set may be used with hard-of-hearing aid if desired.

F 3631

Two-Way Speaker for Side Wall



Taking advantage of sound distribution from both sides of the speaker cone, a two-way speaker cabinet is now offered with opening at front and rear. It is made of steel and provided

with a sturdy side-wall mounting bracket designed for use in halls, corridors and similar locations for public-address.

Auto Log

Radio Log and Time Compensator

F 3655



Over 1,600 long and short-wave stations in all parts of the world are listed on this rotating log. Its 140-in. tape contains call letters, frequencies, power and chain affiliation. A handy time compensator enables the operator to calculate instantly the time differential at any point on the surface of the globe.

F 3642

Austrian Set Has Timing Unit

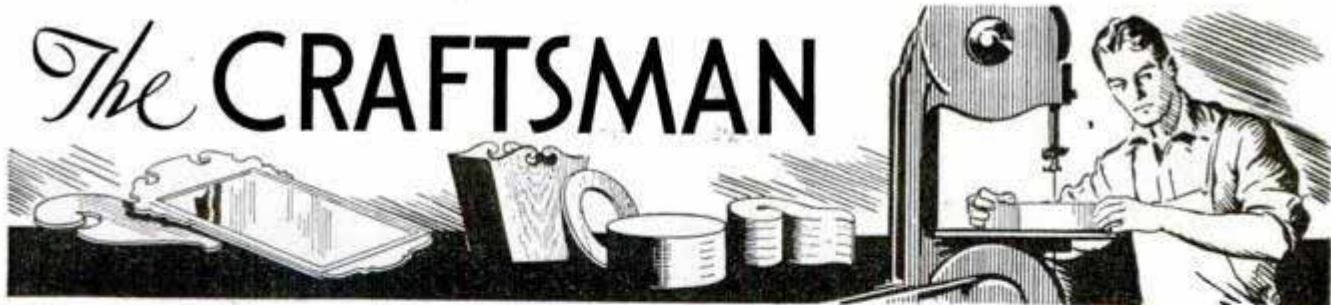


An electric clock built into this Austrian receiver enables the operator to select station programs in advance. A clock-controlled line switch is set to start, or stop, the receiver at any predetermined time. The chart at center lists more than 100 European stations.

Blueprints covering radio construction articles in past issues are available for 25 cents each; original material lists and additional information can be obtained from our Radio Department without charge upon receipt of postage.

NEXT MONTH—How to Build a One-Tube Band-Spread DX Short-Wave Receiver. A practical inexpensive short-wave set for beginners; uses one of the new dual-purpose 6N7 metal tubes. Other features include construction details for a **Simple Crystal-Controlled 40-Meter Transmitter** using a type 6L6 "beam" tube.

The CRAFTSMAN



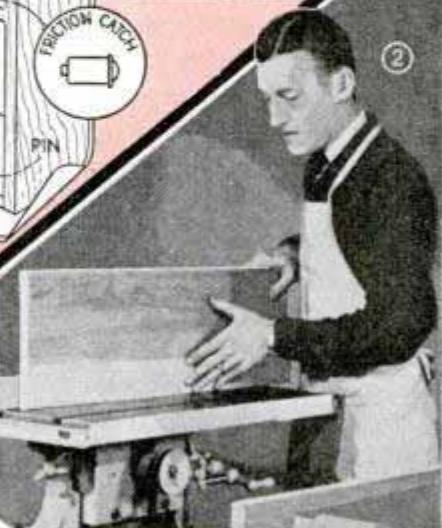
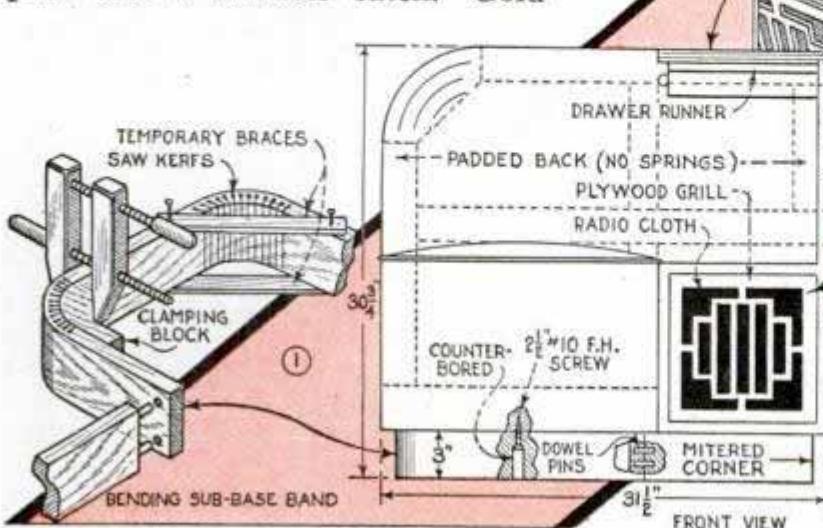
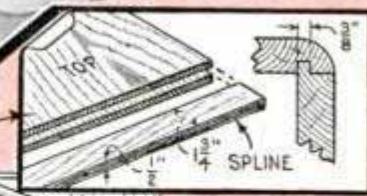
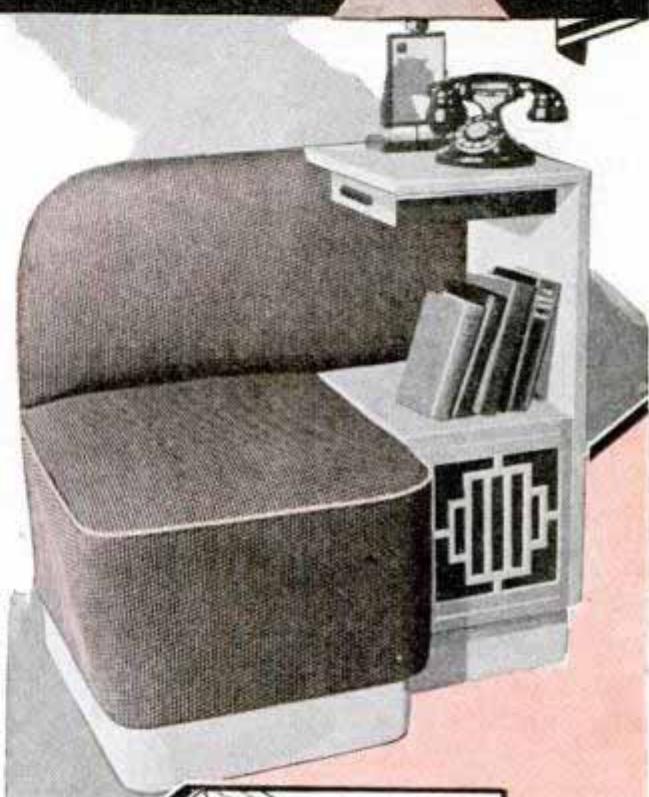
modern TELEPHONE SET

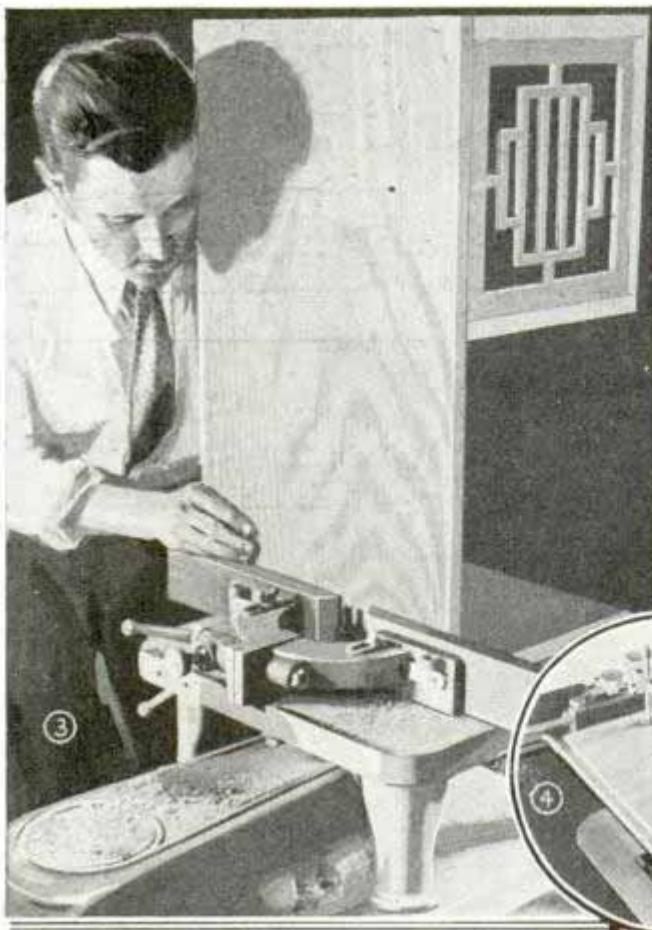
Snug, upholstered seat, combined with a smart phone stand, offers both comfort and convenience

By WAYNE C. LECKEY

NEW styling makes this modern telephone set, with its invitingly comfortable bench, a striking piece of furniture for the living room or hall. A cloth-backed grille conceals the bell box, and a convenient drawer accommodates a directory, memo pads and pencils.

For a bone-white finish on the table, use poplar, gumwood or pine. Figs. 1 and 7 detail the general construction of the table section. Blind mortise-and-tenon joints are used throughout, and can be cut accurately with a dado head or on the shaper, as in Figs. 2, 3 and 4. To prevent warping of the table top, a spline is inserted as in Fig. 1. The plywood grille for the bell box, Fig. 1, is fitted with two pins and a friction catch. Gold-

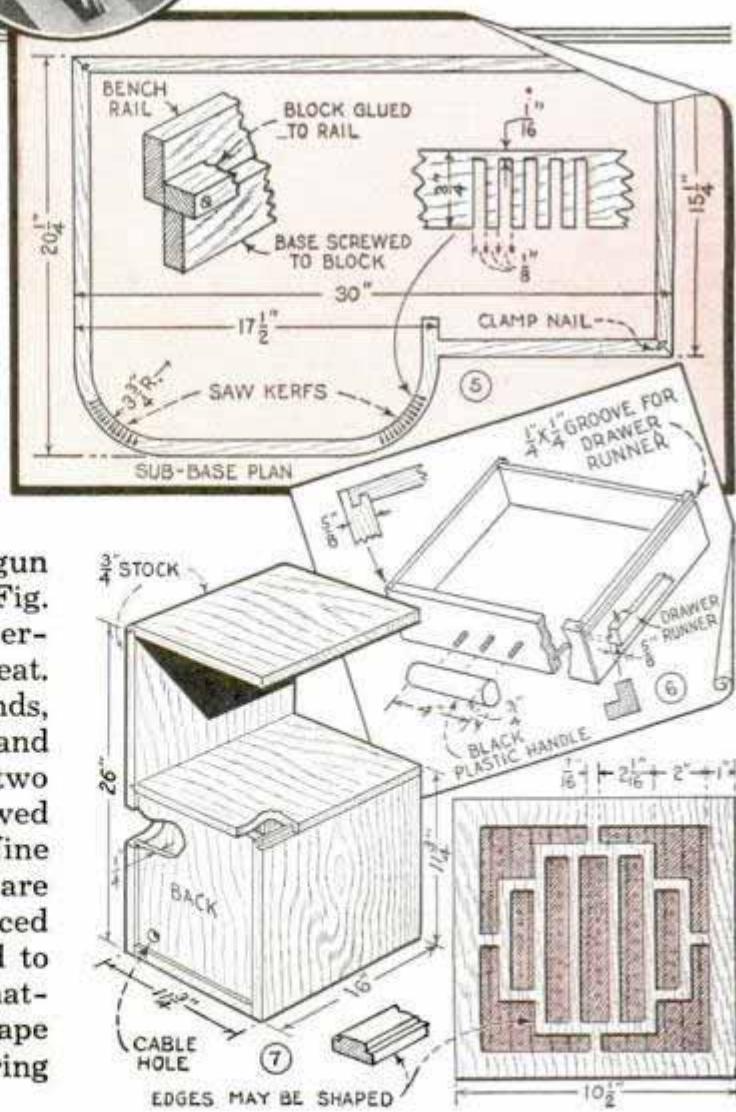




bronze cloth is glued to the back of the grille. The outer edge of the top is rounded after assembly. Figs. 1 and 6 detail the drawer which is fitted to two runners screwed to the underside of the top. The front and sides are $2\frac{1}{4}$ in. wide.

The framework of the bench, Fig. 10, should be made of hardwood. The plain butt joints are reinforced with corrugated fasteners. Curved corners of the frame are formed from thick blocks band-sawed to shape after being glued. Upholstering is begun by webbing both seat and back as in Fig. 10, the webbing on the back being interwoven in the same way as that on the seat. Tacks are staggered in the webbing ends, after which the webbing is folded back and retacked. When the seat is webbed, two 4-in. corner blocks are glued and screwed to the frame for additional support. Nine No. 5 wide-center upholstering springs are used in the seat. These are evenly spaced in line, three in a row, and are sewed to the webbing with strong stitching or mattress twine, as shown in Fig. 10. To shape the corners of the seat, a No. 10-ga. spring wire edge is added.

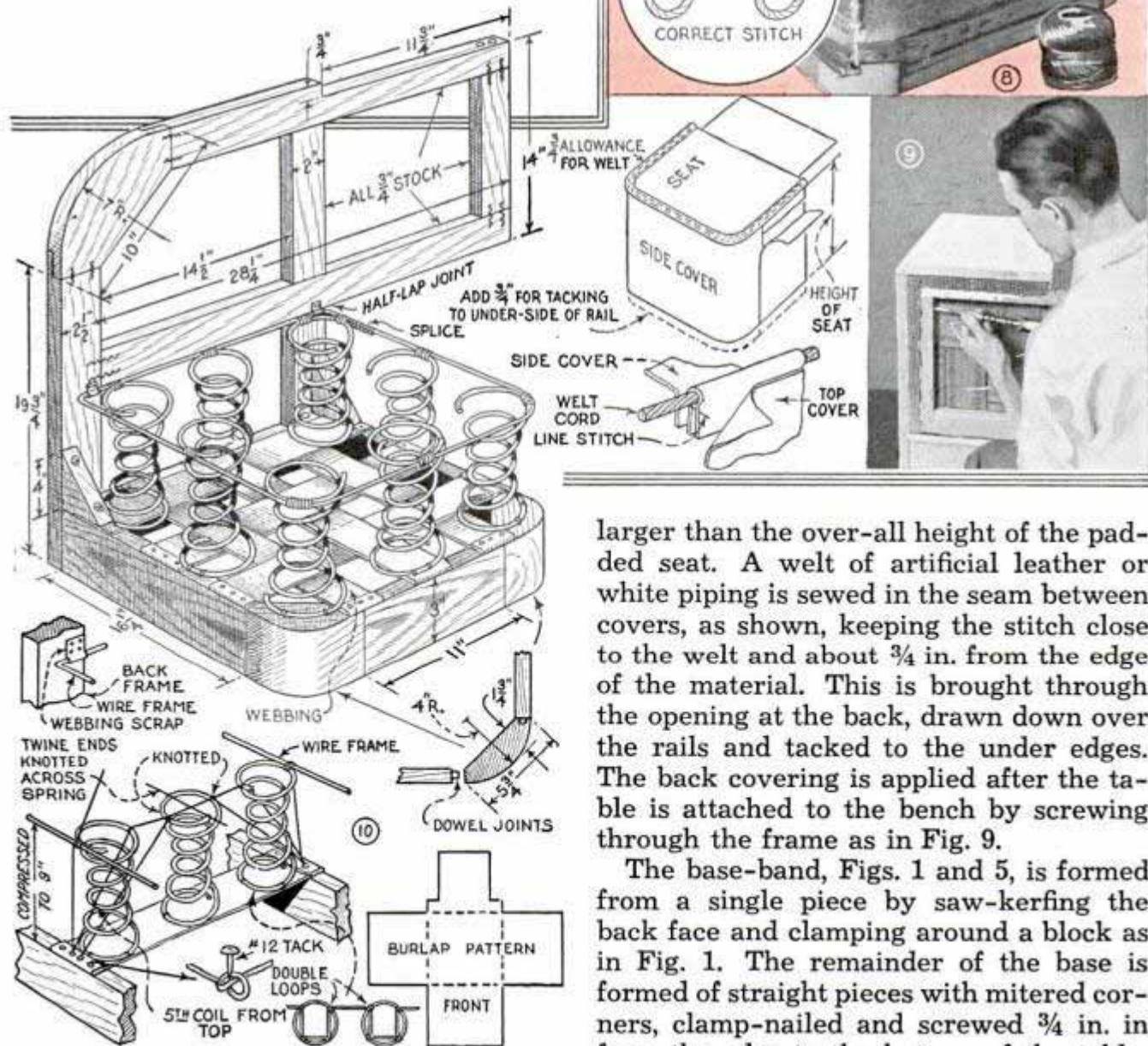
The lower detail in Fig. 10 shows the procedure in tying a single row of springs. The same method is used throughout. Tying is started by compressing the center spring in each row, a length of twine being knotted to the top coil. The ends are brought down through the outer springs and knotted twice to the fifth coil from the top. The twine is continued to the rail and is fastened with a No. 12 tack driven through a knot in the twine. Twines connecting the center springs are then knotted to the outer ones and passed down through to the fifth coil, knotted, tacked to the rail, and then brought up over the wire edge and tied across the tops of the springs. After tying the springs, a covering of burlap is applied over the springs and over the webbing on the back. The burlap pattern for the seat covering is tacked to the inside edges of the frame at the back. The edge is folded over so that



the tacks go through two thicknesses of the burlap.

To shape the seat and retain the padding, a roll edge of tow is sewed around three edges of the seat, Fig. 8, the tow being fashioned by hand into a roll approximately $1\frac{1}{2}$ in. in diameter and sewed to the wire edge with a looping stitch. The top is then padded with a curled-hair filling which is held in place with long, running stitches through the burlap. The back is padded with a 4-in. layer of hair sewed to the webbing. A layer of cotton is applied over the hair to keep the wiry strands from working out through the covering. Now the back is covered with upholstering fabric, tacking the edges to the back of the frame, being careful to keep the cloth pulled evenly and driving the tacks not more than 1 in. apart.

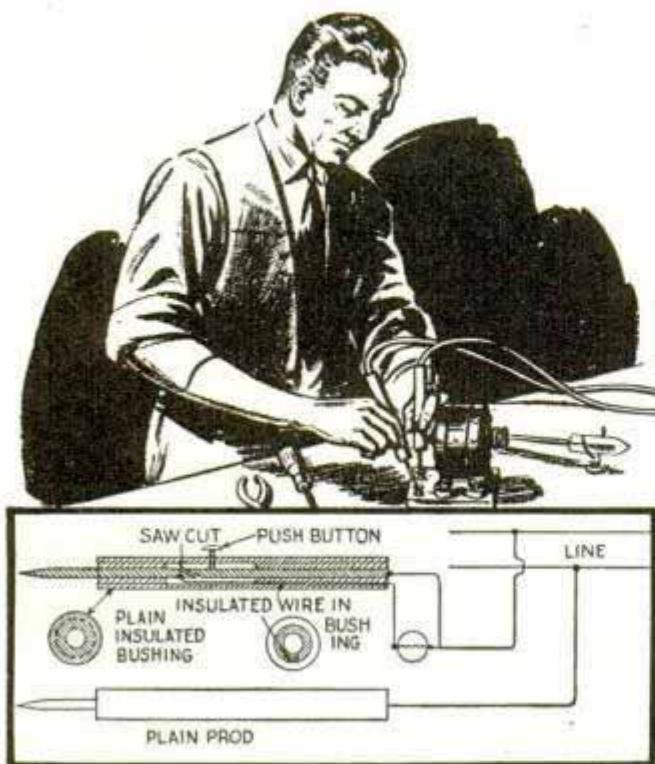
The top covering, Fig. 10, is cut $\frac{3}{4}$ in.



larger than the over-all height of the padded seat. A welt of artificial leather or white piping is sewed in the seam between covers, as shown, keeping the stitch close to the welt and about $\frac{3}{4}$ in. from the edge of the material. This is brought through the opening at the back, drawn down over the rails and tacked to the under edges. The back covering is applied after the table is attached to the bench by screwing through the frame as in Fig. 9.

The base-band, Figs. 1 and 5, is formed from a single piece by saw-kerfing the back face and clamping around a block as in Fig. 1. The remainder of the base is formed of straight pieces with mitered corners, clamp-nailed and screwed $\frac{3}{4}$ in. in from the edge to the bottom of the table.

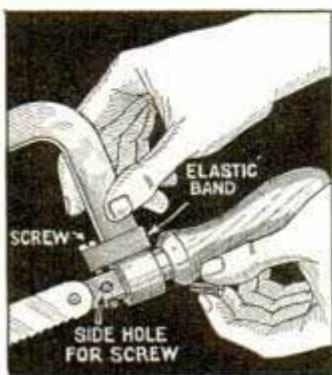
Test Prods Serve Two Purposes on the Test Bench



Full line voltage is available through these test prods by merely pressing a button on one of them

Differing from the usual type of test prods in that one of them has a fingertip switch to cut in full line voltage, these prods may be used to supply current for operating small motors and other devices momentarily while making a test. A fiber tube is used as the cover for the dual-purpose prod, which consists of two lengths of brass rod securely held inside the tube with fiber bushings. A small screw with an insulated head serves as the switch, which, when pressed, brings the severed ends of the prod together, thus shorting out the light, bell or other warning device commonly used so that the full line current is available at the end of the prod.

Changing Hack-Saw Blades



Here is a simple attachment to prevent the handle of a hack saw from turning while changing a blade. It consists merely of a screw clamped to the saw frame with a strong rubber band. In use,

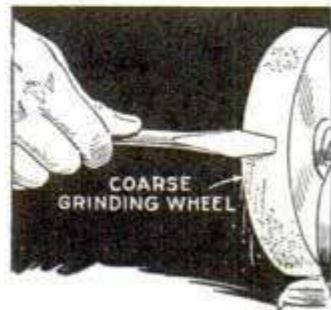
the screw is slipped into one of two holes drilled through the handle shank arm at right angles to each other. The horizontal hole takes care of any occasion when the saw is used sideways.

—H. Moore, Hamilton, Ont., Can.

Screwdriver Scored on Stone to Prevent Slipping

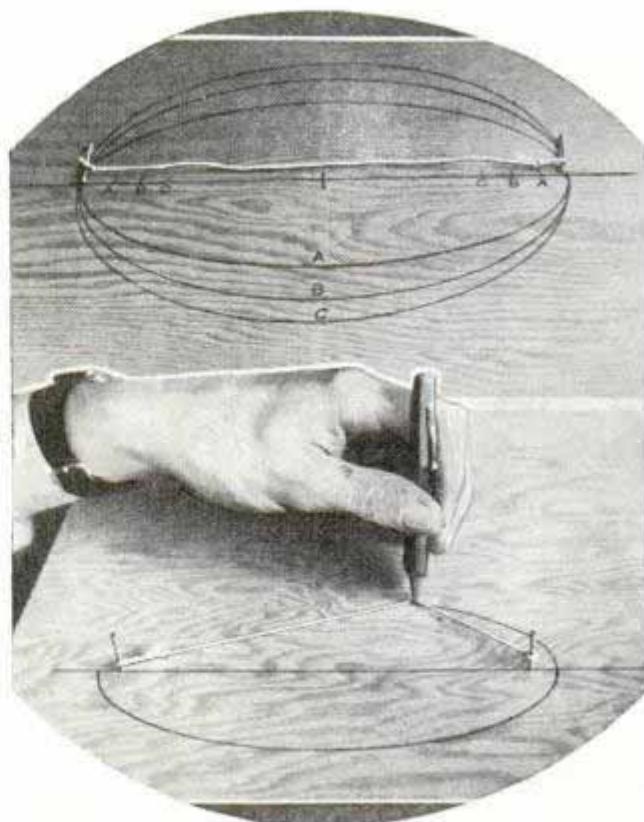
The tendency of a screwdriver blade to slip out of a screw slot can be prevented to a certain extent by sharpening it on a coarse grinding wheel. The blade should be held at right angles to the face of the stone so that the scores parallel the edge of the blade.

—C. E. Packer, Chicago.



Ellipse Drawn with Aid of Cord

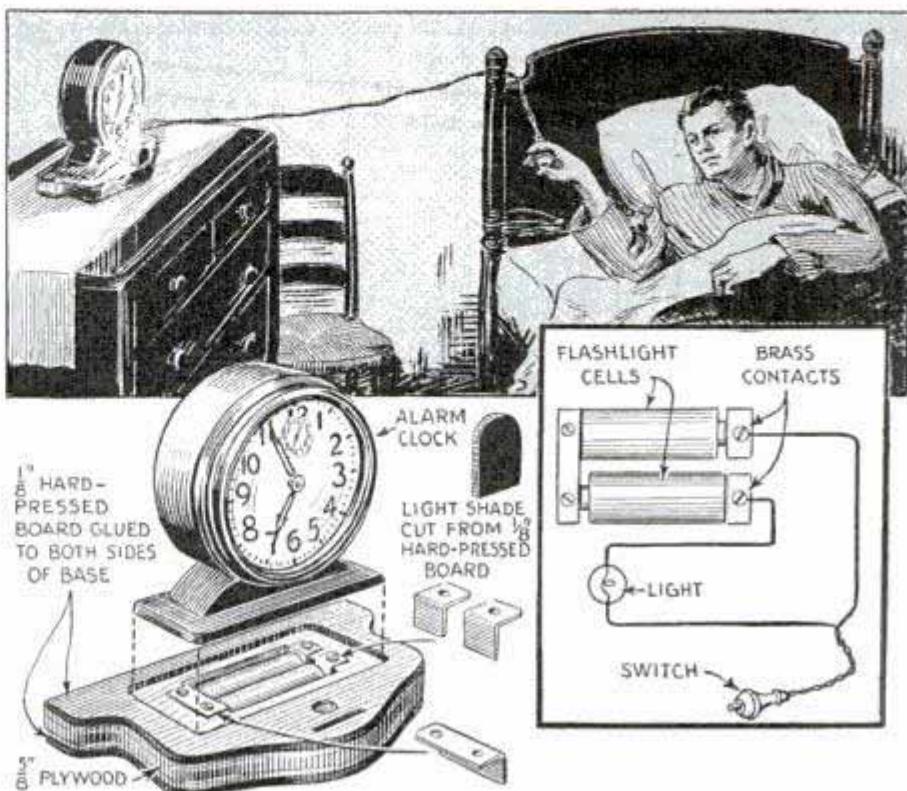
A length of hard, braided cord, two pins and a pencil is all the equipment you need for laying out an accurate ellipse of almost any size. First, lay off the center line on



You can draw an ellipse of any size accurately by using a string and a lead pencil

the work. The long dimension of the ellipse is equal to the length of the string between the pins, so you drive the pins into a piece of waste stock a measured distance apart and tie the cord to them so that the cord will be taut. To make the ellipse a given width, measure from the mid-point of the center line, a distance equal to one-half the width desired. Hold the two pins on this mark, hook a pencil point in the doubled string and swing through 180 degrees, marking the points at which the pencil crosses the center line. Set the pins on these points and you have it. Note positions of A, B and C in the illustration, from which you will see that you can vary the width at will.

Clock Lighted by Sleeper Pressing Button on Bed



Alarm clock with self-contained light in base shows the time at a press of a button without sleeper getting out of bed

Short Lengths of Fencing Wire Stretched with Auto Jack

For small fencing jobs, especially when repairing a broken wire, where lengths of 10 rods or less are to be stretched, an auto jack will serve as a substitute for a stretcher. A notch is cut in the edge of the jack lift plate to engage the wire.



An auto jack will quickly stretch short lengths of barbed wire when repairing a fence

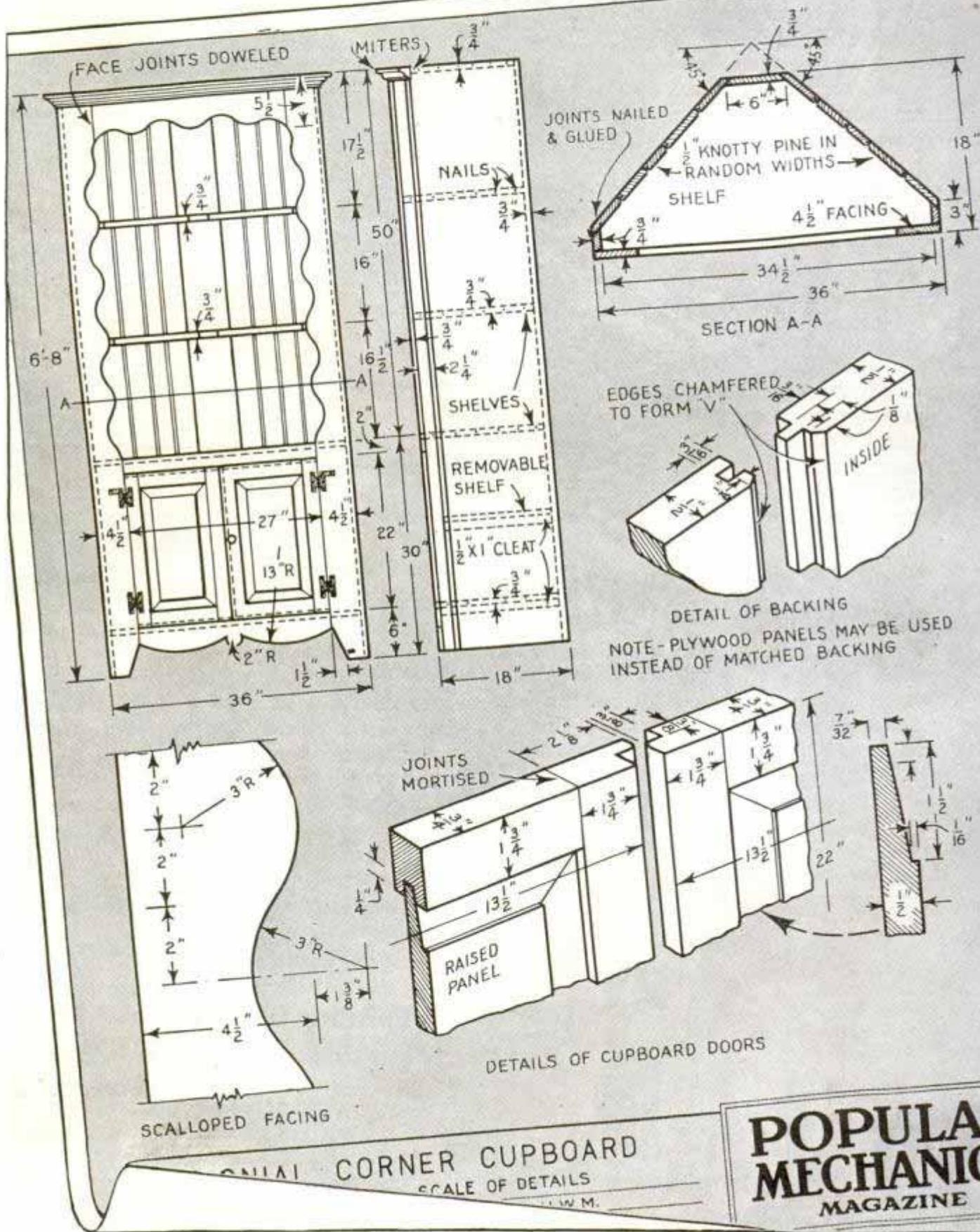
With this electrified alarm-clock base, you just press a button to see the time instead of getting out of bed to turn on a light. Two pen-type flashlight cells are concealed inside the base and a flashlight bulb is placed behind a small shade in front of the clock. The base is $5/8$ -in. plywood with strips of $1/8$ -in. hard-pressed wood glued to both sides. A small shade for the bulb is cut from the same material. The right-hand detail shows the wiring on the underside of the base before the pressed wood is glued in place, while the other detail pictures the top and battery compartment, which is concealed by the clock.—Kenneth Murray, Sturgis, Mich.

Painting Temporary Signs

When temporary signs are painted on wood, glass or metal, it's a good idea to first apply a thin coat of grease or mineral oil to the surface. Paint applied to such a surface will stand up quite a while, but can be removed easily at any time by merely wiping it with a cloth.

—M. R. Pesce, Chicago.

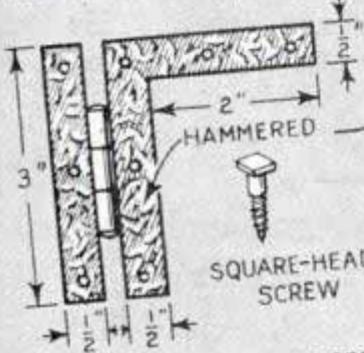
Colonial Corner



Cupboard



DETAIL OF CROWN MOLDING

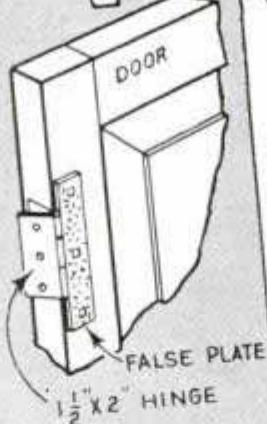


DETAIL OF UPPER HINGES
LOWER HINGES SIMILAR
BUT WITHOUT ARM

PINE OR MAPLE



MADE FIVE LIKE THIS OMIT SCROLL ON THREE



FALSE PLATES MAY
BE USED INSTEAD
OF 'H' HINGES

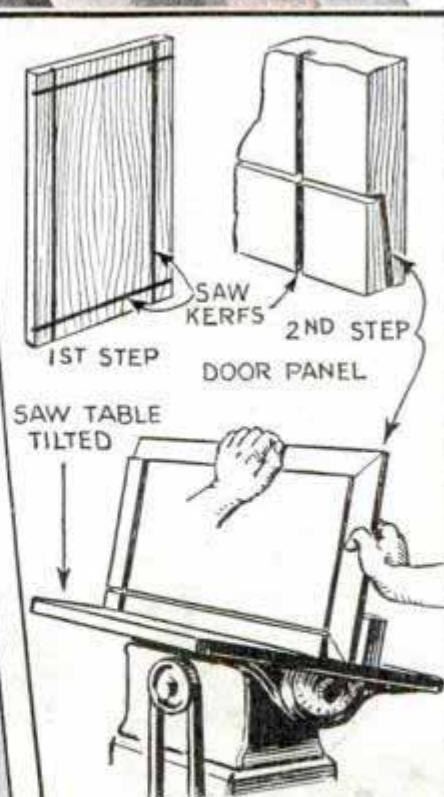
SHELF STOCK GLUED
FOR WIDTH

ECONOMICAL METHOD FOR LAYING OUT SHELVES

To display your fine pieces of pewter and china on open shelves in the dining room, this colonial corner cabinet is just the thing. Note how it fits snugly against the wall, the legs being recessed to take the baseboard. Facing and back are nailed to the shelves which form the framework

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B.P.



THE RAISED DOOR
PANELS ARE FORMED
ON THE CIRCULAR SAW

Models Assembled from Celluloid Show Working Parts Clearly

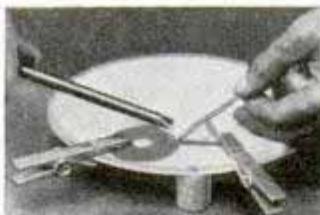


When building a working model of a device for display or test purposes, it is a good idea to use heavy transparent celluloid for the exterior parts so that the moving parts can be seen clearly. Celluloid is readily cemented together, thus simplifying the assembling of the parts.

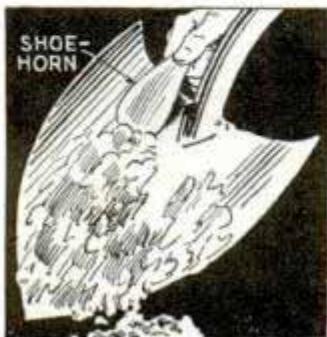
Home Workshop Soldering Table

For small soldering jobs on your workbench, an asbestos stove mat makes a good table. It should be fitted with four

short legs to raise it 2 or 3 in. above the bench top, to permit the use of light clamps or spring-type clothespins to hold small pieces in position for soldering.



Shovel Scraper from Shoehorn



Instead of wasting time looking for a thin piece of wood to scrape his shovel, one workman carries a shoehorn in his pocket for this purpose. While the horn serves

nicely in its original form, a wider scraping surface can be had by squaring the wide end, rounding each corner slightly to eliminate the pointed ends.

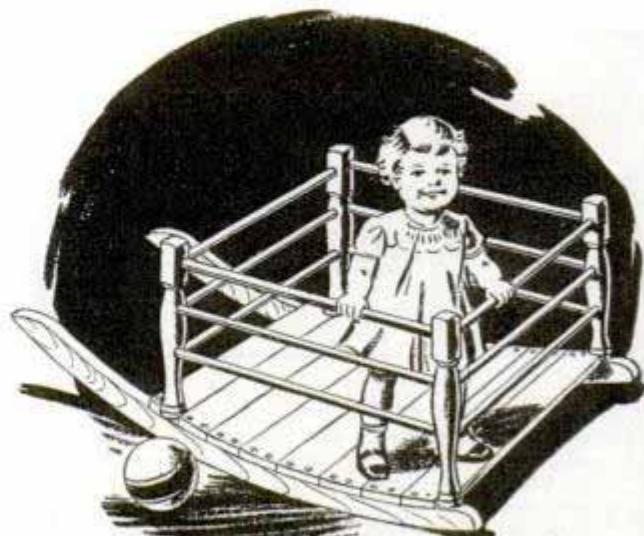
Drawshave of Steel Tubing Smooths Scrollwork

For cleaning up scrolls and similar work where a regular drawshave cannot be used, this tool will do the job quickly. It is made in any desired size from open-seam steel tubing by merely bending down one edge of the seam so that the other edge projects slightly. This is done with a hammer and a piece of flat iron. Beveling one side of the projecting edge of the tubing completes the job.



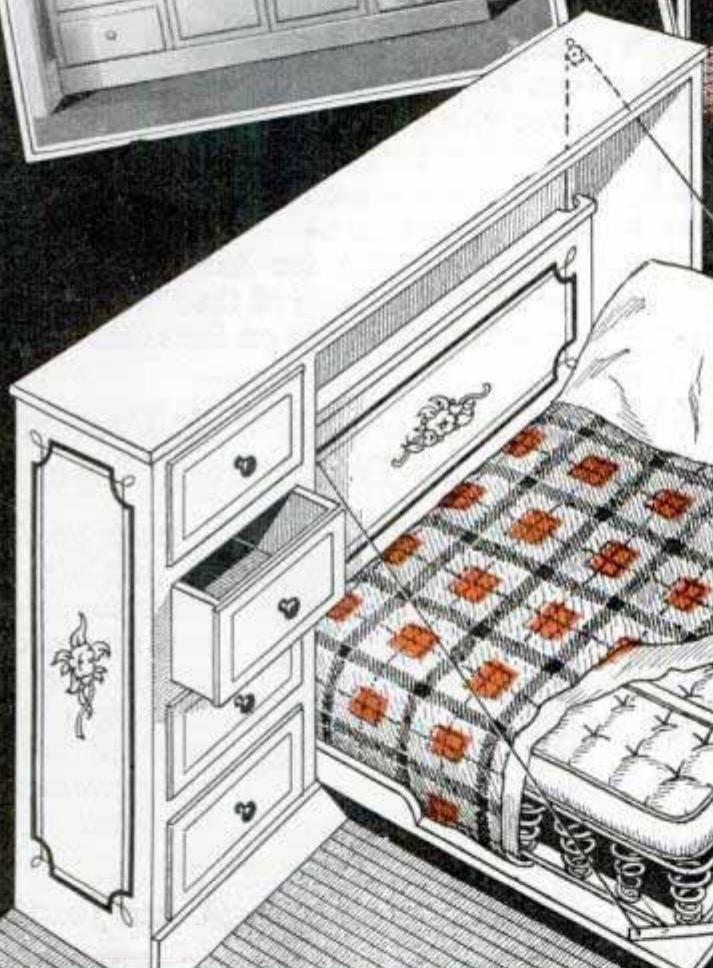
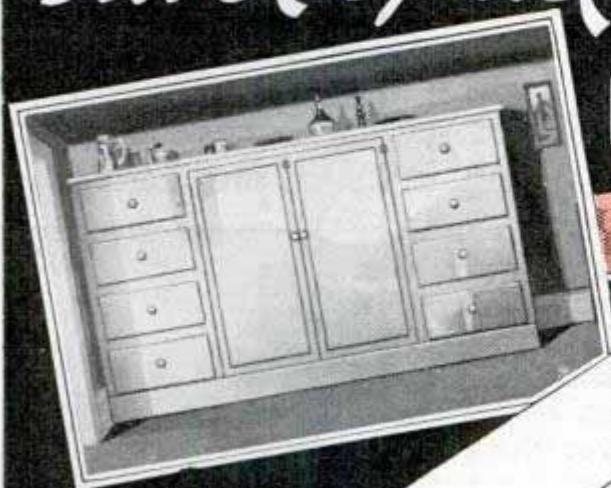
Rocking Play Pen Amuses Baby for Hours at a Time

If you have an old rocking chair that has been discarded, it can be converted into a small play pen that will afford the baby much amusement. Just remove the seat and back, and then nail slats across the rockers as shown. If the legs and rungs are loose, it is a good idea to reglue and nail them, and it may be necessary to add a few rungs so that the baby cannot crawl out of the pen.

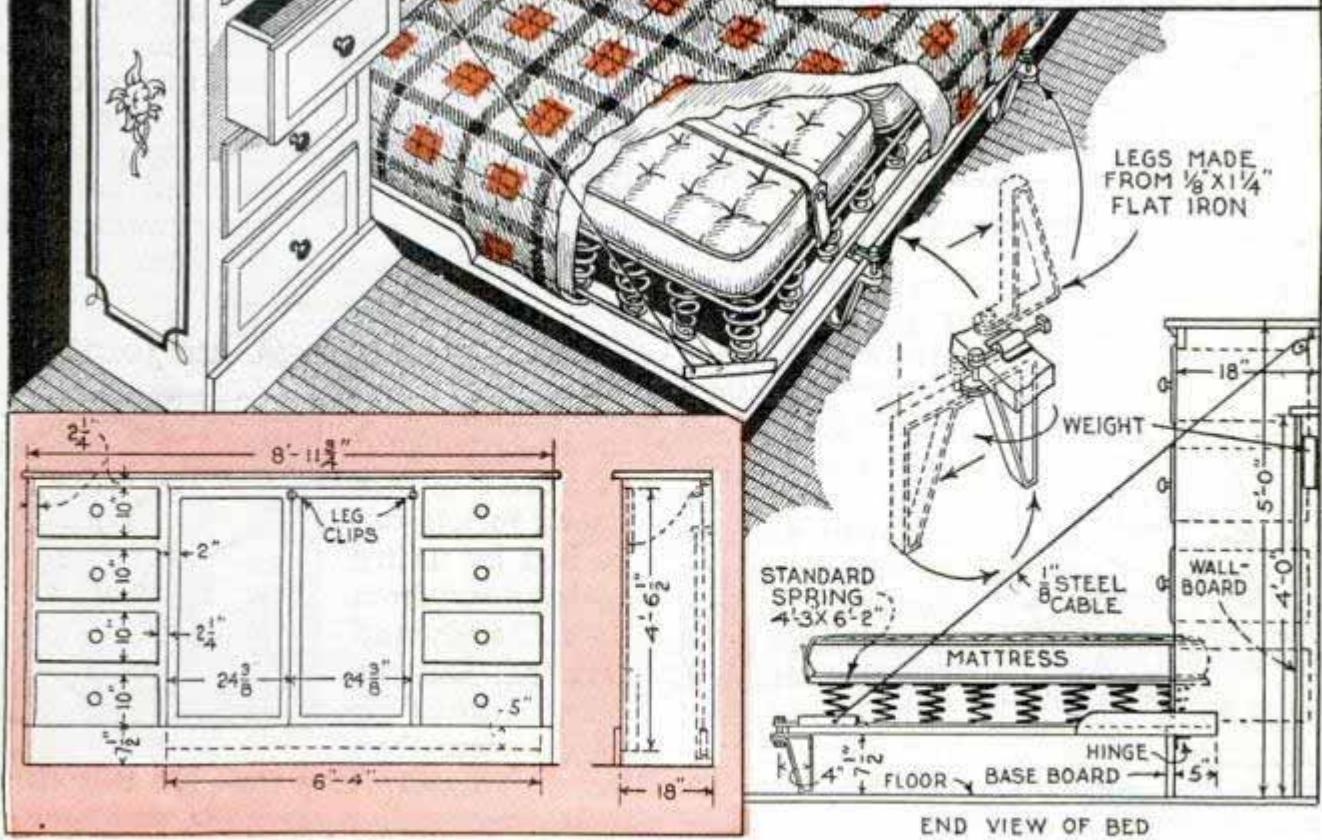


An old rickety rocker is still useful if you convert it into this play pen for the baby.

"IN-A-CABINET" BED Saves Space

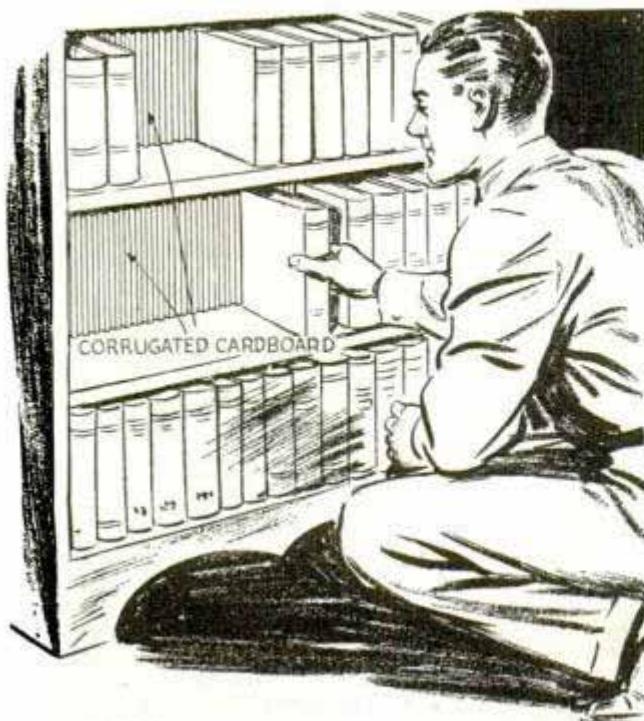


Any room in the house becomes a bedroom when you open this cabinet to reveal a complete double bed. The mattress is strapped to the spring, which is in turn fastened to a 1-in. plywood panel. Counterweights keep the bed in position when the cabinet is closed. Moldings and false fronts fastened to the panel supporting the springs simulate drawers and paneled doors—effectively disguising the real purpose of the cabinet. Folding legs, hinged so that they pivot in two directions, support the bed when the cabinet is open and fold inside when it is closed.



END VIEW OF BED

Bookcase Has Corrugated Back to Hold Volumes Erect



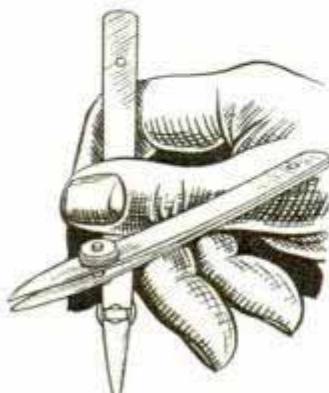
Books will not tip when one is removed if corrugated cardboard is glued to the back of the case

The problem of keeping books neatly erect in a bookcase, especially when the shelves are not entirely filled, is solved by strips of corrugated cardboard glued to the back of the case. The books are pushed against the corrugations to prevent them from tipping. Where the depth of the bookcase is greater than that of the books, which are alined with the front edge of the shelves, only the last book is pressed against the corrugated backing.

Ruling Pen from Tweezers

Amateur draftsmen who want an inexpensive ruling pen for practicing, can

make one for a few cents from a pair of tweezers of the type shown. The ends of the tweezers are ground down on the outside to a long tapered point slightly rounded. A hole is drilled for a small machine screw, the



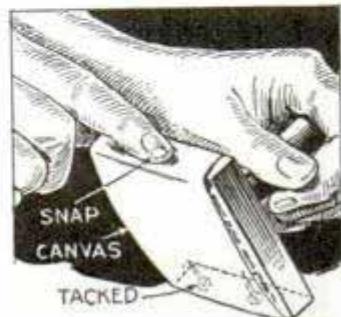
head of which is soldered to one blade of the tweezers while the threaded end is fit-

ted with a thumb nut for adjusting the spacing of the blades. The screw hole in the blade next to the nut should be a little oversize to avoid binding when the blades are spread apart. The rounded portion of the pen point should be sharp but honed carefully to remove burrs from grinding, so that it will slide smoothly.

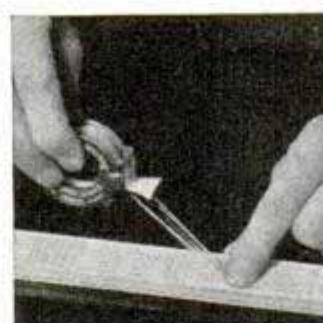
—Peter Baratta, New York City.

Rubber-Stamp Faces Shielded Against Dirt and Lint

When rubber stamps are seldom used, it's a good idea to provide a cloth shield, which can be fastened over the face to keep dirt and lint from collecting on it. A piece of canvas is suitable for the purpose, being tacked to one edge of the stamp and having a snap fastener on the other edge.



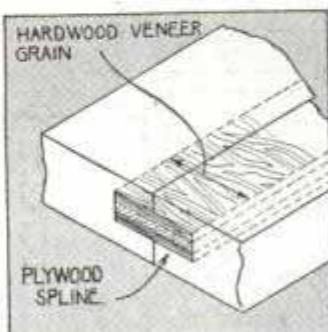
Data on Slide Rule Protected by Transparent Tape



It's a good idea to put strips of transparent cellulose tape over the sides of a slide rule, to prevent constant handling from wearing off the data.

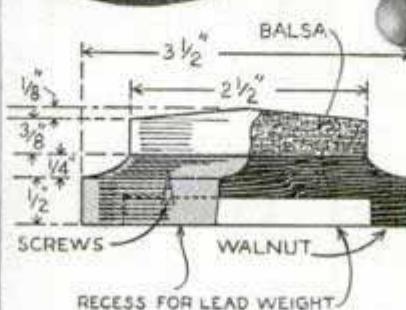
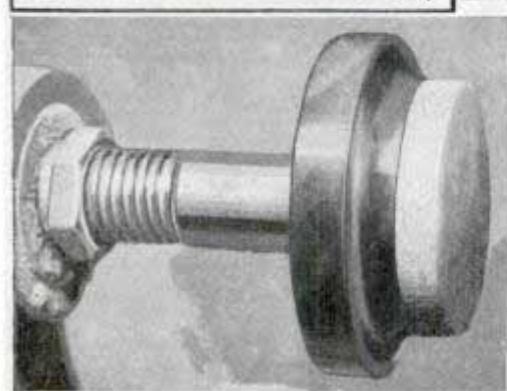
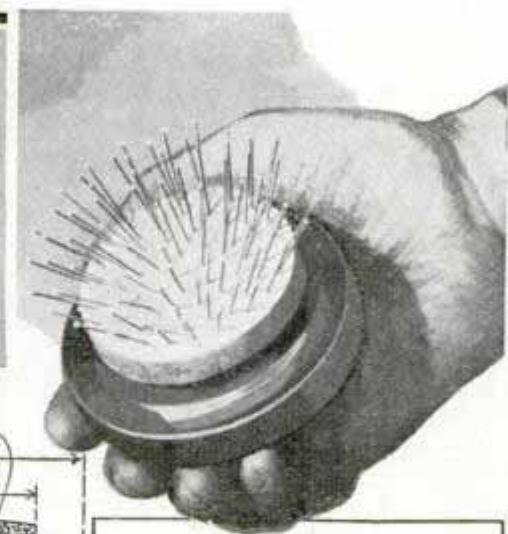
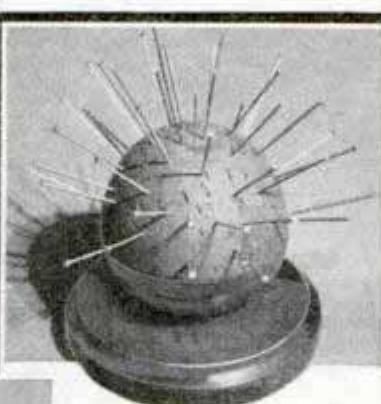
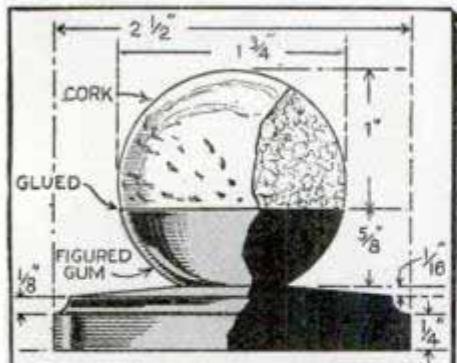
Making Strong Glue Joints

When gluing up table tops and similar work, strong joints can be had by using splines cut from $\frac{1}{4}$ -in. hardwood plywood. Cut the splines about $\frac{1}{16}$ in. narrower than the grooves to allow for glue and have their cores run lengthwise of the grooves.



—M. Wood, Port Washington, N. Y.

Pincushions Turned from Wood and Cork



If the pincushion seems too light in weight, the base may be recessed to take a lead disk after which the underside is covered with felt

Attractive as well as useful, these pincushions are easily turned on your lathe, make ideal gifts or prizes for card parties and, if desired, can be turned out in quantities and disposed of at a good profit. To make one, glue the cork or balsa-wood

cushion to a piece of maple, walnut or gum wood from which the base is to be made, and mount the assembly in the lathe. Then turn down the base and shape the cushion with a sandpaper block while the work rotates.

Amateur Chemist's Face Shield Adjusted to Any Position

When working over chemicals, a face shield like the one shown can be adjusted to almost any position desired. It is assembled from a heavy floor flange, a length of flexible conduit and a clear glass disk, which is mounted in a metal frame. Or, if you have an old desk lamp with a flexible support at hand, the framed glass disk can be substituted for the reflector and lamp socket. Or, you can solder two prongs to the glass frame to engage a plug, screwed into the socket.

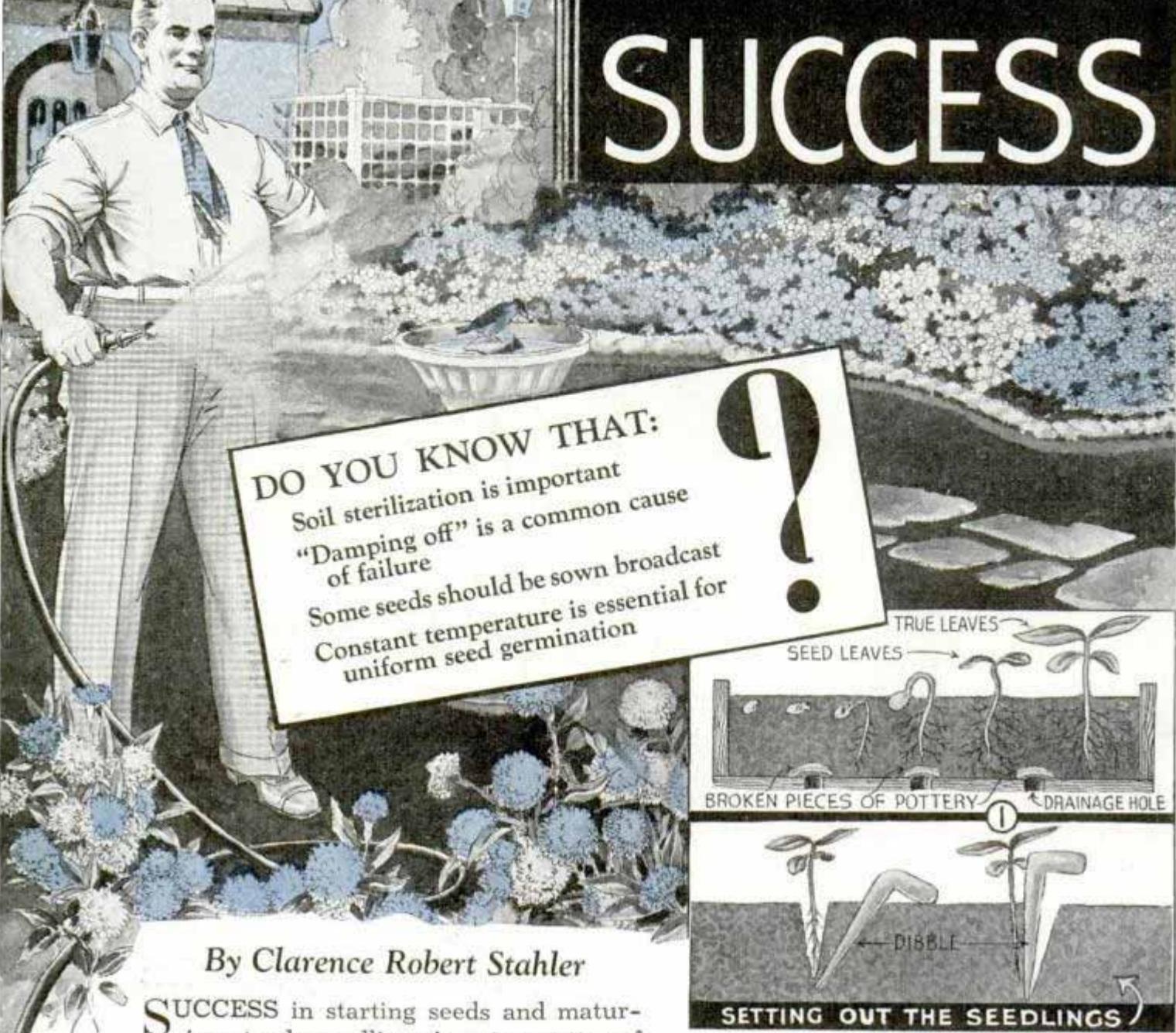
Blackboard and Slating Paint

Blackboards can be made on a smooth plastered wall or a shellacked wood panel by applying several coats of the following paint: Fine lampblack, 2 oz., mixed with fine pumice stone, 8 oz., and boiled linseed oil, 16 oz. To this, add enough turpentine to make 4 pts. Let the surface dry and sand it smooth between each coat.



Quickly swung into position, the shield is readily assembled from parts easy to obtain

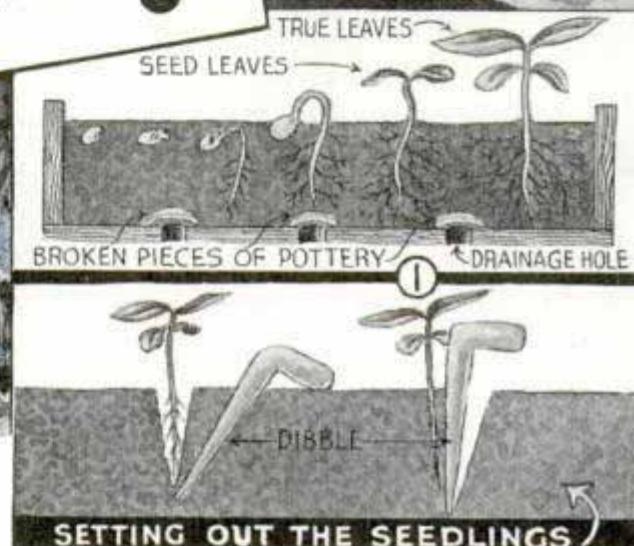
SUCCESS



By Clarence Robert Stahler

SUCCESS in starting seeds and maturing sturdy seedlings is not a matter of luck. Satisfactory results depend upon application of fundamental principles and attention given to small and seemingly unimportant details. Failure is often due to fungi, destructive to the seed embryo and to the seedling itself after emergence above the ground. This trouble, known as "damping off," often occurs in seed-sown flats, cold frames and hotbeds. Besides failure of seedlings to emerge at various places throughout the rows, later symptoms are manifested by malformed stems and seed leaves, stunted growth, or collapse and death of the seedling.

Soil sterilization is the remedy for this trouble. Where you have only small quantities of soil to handle, oven-baking will serve the purpose. Sift good garden soil through a sieve, using 6-mesh hardware cloth, and dampen the mass throughout. Then pack the soil in shallow pans, bed a



SETTING OUT THE SEEDLINGS

potato in one and bake in an oven at 300° F. until the potato is well done, Fig. 3. Meanwhile, sterilize all articles used when sowing seed—seed flats, sieves, pieces of broken pottery, etc. Formaldehyde, 2 oz., to water, 1 gal., is very effective for this. A still better method of using formaldehyde is to sprinkle it on a floor, pile the dipped appliances over it and cover with a large canvas.

For sterilizing large quantities of soil where oven-baking is impractical, the soil is treated with formaldehyde dust. This consists of formaldehyde and powdered charcoal in the proportions of formaldehyde, 1 oz., charcoal, 6 oz. Slowly add the liquid to the charcoal powder, stirring constantly. After a thorough mixing, place the mixture in a covered container and shake vigorously. Then sift to break up the lumps and store in an air-tight con-

with SEEDS and SEEDLINGS



FIRST THE SOIL
IS SIFTED

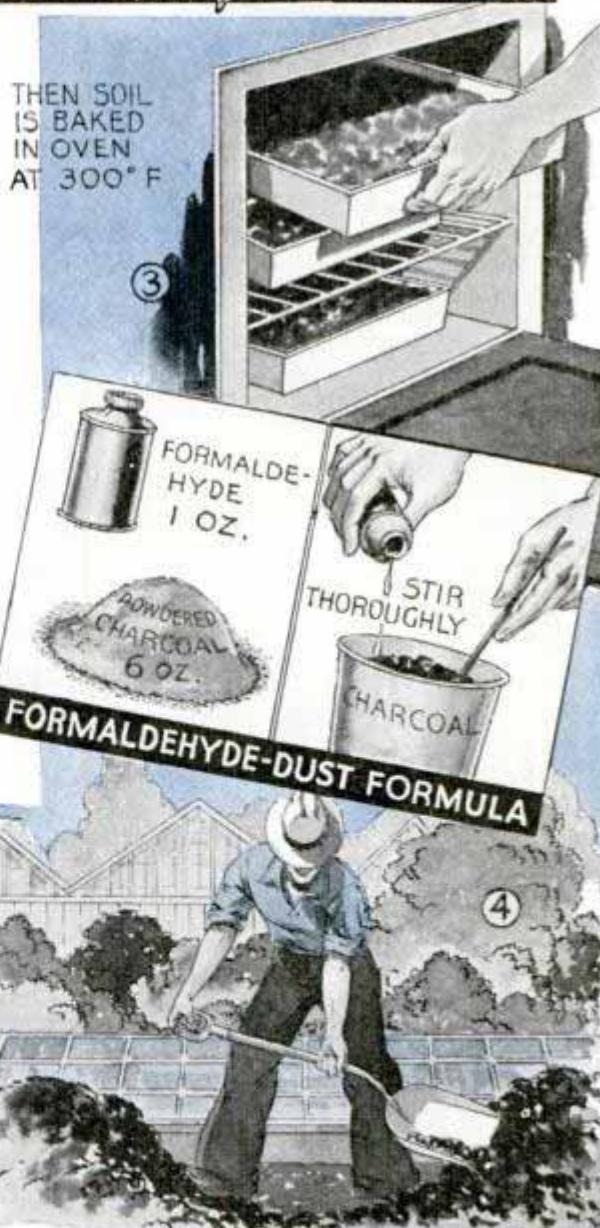
AND PACKED IN SHALLOW PANS

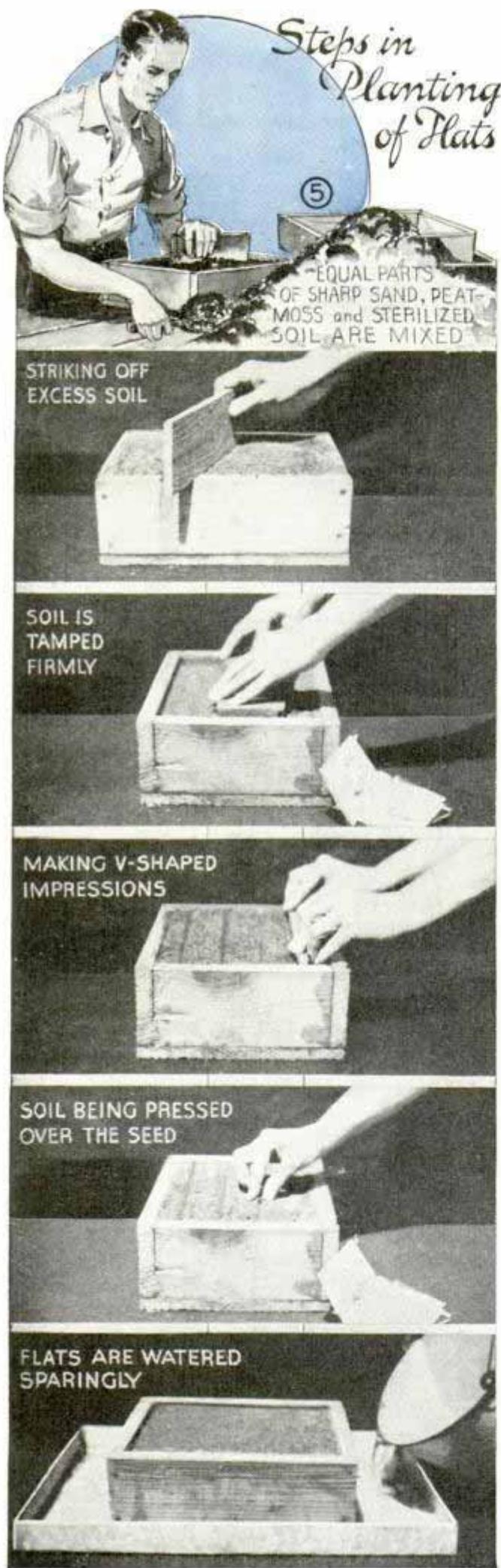


Methods of Soil Sterilization

tainer. Next, sift the soil to be sterilized through a screen onto a platform or walk, spreading it out in a 1-in. layer. Apply the dust in the proportion of $\frac{1}{2}$ oz. to each square foot of soil. Mix the dust and soil by shoveling the mass back and forth five or six times as in Fig. 4. Then place the soil in the hotbed and wet down thoroughly. After 24 hrs. seed may be sown. When transplanting seedlings into soil thus sterilized, delay planting at least 72 hrs. after treatment. After sterilizing, avoid introduction of organisms with soiled hands, trowels, watering devices, etc.

While seed flats are soaking in a tub of water, mix the seed-starting medium of equal parts clean, sharp builder's sand (usually sterile if newly obtained), damp peat moss and sterilized soil. Before measuring, sift the sand through a 14-mesh screen, and the soil and peat through the soil sieve. The mixed soil should be damp but not soaked. Test the mixture by squeezing a handful and rolling it between the fingers. If it does not crumble readily it is too wet. Space $\frac{1}{2}$ -in. holes 3 in. apart in the bottom of each flat and place a piece of broken pottery over each hole to provide the proper drainage. Heap soil into a water-soaked flat and strike off the surplus with a straightedge as in Fig. 5. Settle by raising the flat and dropping it on a table. Repeat this several times, then refill and strike off level. To facilitate drain-





age and to assure rise of the moisture to the surface, the soil particles must be pressed in close contact by tamping firmly.

Tiny seeds—petunia, salpiglossis, campanula and the like—should be broadcast without covering and blocked down against the soil. Larger seeds are sown in a shallow furrow the depth of which should be about four times the thickness of the seed. Sowings may be made a bit thick only if the seedlings are to be transplanted as soon as the true leaves develop. After pinching the soil over the seed, block down firmly. Sow only one variety of seed in a single flat. If the seed flats are thoroughly water-soaked in the beginning and if the soil carries the right moisture content, no watering will be necessary at this time. Seeds do not need a soaking-wet soil in which to germinate. If watering must be done before germination takes place, set the flat in a shallow pan of water and after sufficient moisture has seeped up through the drainage holes to show dampness on the soil surface, remove the flat. Use water from which the chill has been removed.

Covering the seed bed loosely with a single thickness of waxed paper helps prevent drouth, and is particularly beneficial to small seeds. If you do this, remove the paper daily and inspect for signs of germination after which the paper is not replaced. Spontaneous germination of seeds in furrows often heaves the soil badly which increases drouth. To remedy this, wet a piece of loosely woven cloth and press it lightly on the soil. A constant temperature of 60 to 65° F. is best for germination. Never stack the flats.

The upper detail of Fig. 1 shows six stages in the germination and growth of a seedling. In the second stage the seed is swollen into a soft, pulpy mass. At this stage a few minutes of complete drouth will dry out the embryo and kill it. Therefore, keep the top soil dampened until emergence is complete. In the third stage you see the stem boring down and the rootlets forming. The stem will continue downward as in the fourth stage until the roots become fixed, after which the stem grows upward, drawing seed leaves from the seed case. In the fifth stage the seed leaves have expanded. Direct sunlight is not essential but strong, outdoor light is necessary. A few hours of subdued light

will "draw" the seedling badly. Grow slowly in cool temperatures; 45 to 50° F. during the long nights of early spring, 50 to 60° during dull days, and 60 to 70° when the days are bright. Use a thermometer, placing the bulb at the soil level. When necessary, water only during the rising-temperature hours of sunny mornings. At the last stage, the first set of true leaves has formed. (Some varieties at first put forth only one true leaf.) The true leaves contain chlorophyll, a green coloring matter, which is acted upon by the sun, and, combining with the soil elements gathered by the roots, produces food for the plant. At this stage the plant needs early-morning sunlight. It should be protected from the mid-day sun with a shade of burlap.

When watering do a thorough job, but less frequently than at first as the roots are now working in lower soil levels. If the seedlings are propagated under glass, ventilation should be provided immediately after watering. If transplanting is done when the first true leaves are well developed, seedlings suffer little or no shock. Don't forget to sterilize the flats several days in advance. To prepare for transplanting, carefully loosen the soil around the roots with a knife blade and pry up gently. Reset the plants at least 2 in. apart. There is always some root injury, which is really beneficial, as it induces strong lateral root growth. Work in a shady place and lose no time in setting lifted seedlings, otherwise the roots are likely to dry out. Seedlings that have made a long stem growth should be set somewhat deeper and the soil pressed firmly about the roots with a dibble as in the lower detail of Fig. 1. After setting, water and shade according to the weather conditions. When several sets of true leaves have formed, pinch out the top shoots to induce lateral growth. Seedlings remaining too long in the flats may develop a faint, yellowish tinge which indicates depletion of soil food, particularly nitrogen. Should it be impossible to set the plants in permanent locations it is permissible to use a good plant food in the proportions of a rounded teaspoonful to each 2 sq. ft. of soil area. Dissolve the fertilizer in water, and after applying, wet the soil and foliage of the plant thoroughly. However, fertilizers should not be used unless absolutely necessary.

Pail Holder for Your Ladder Is Quickly Adjusted

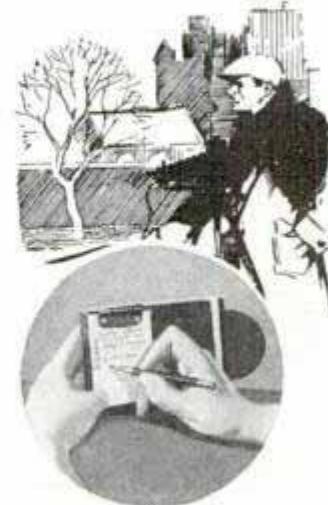


By merely tipping this pail holder upward, you can adjust it quickly to any height

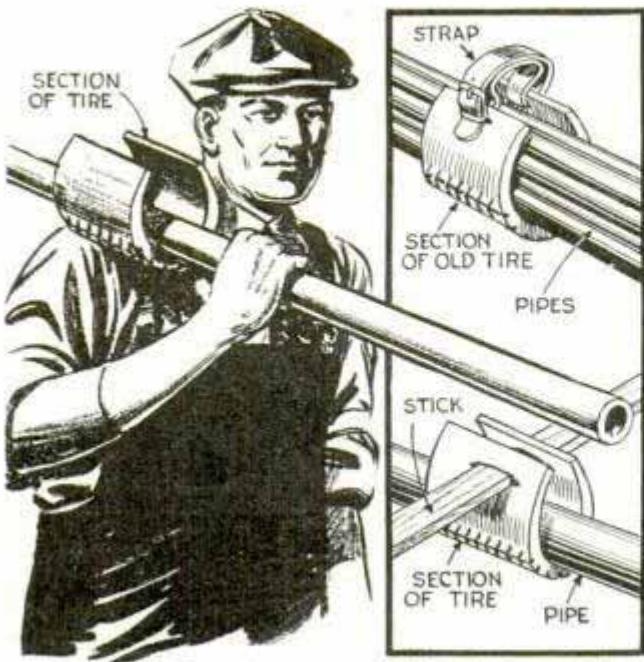
Made from three pieces of flat iron and a wedge-shaped wood block as indicated, this pail holder slips over the ladder rail and is quickly adjusted to any height by tilting it upward slightly, and pushing it along the rail. It is much better than a hook slipped over one of the rungs, as it holds the pail at the side of the ladder where it is easy to reach.

Paper Pad on Film Pack to Record Data

For convenience in jotting down shutter speed, diaphragm opening, light conditions and similar data pertaining to each exposure at the time it was made, I attached a small pad of paper to the back of my film-pack holder. To assure that a pencil will always be at hand for recording the data, a small leather holder can be provided also on the pack.—Pat Fairmont, Cleveland, Ohio.



Shoulder Pad of Auto Casing for Carrying Pipe

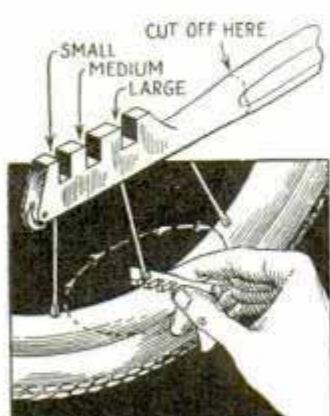


Piece of auto casing makes a good shoulder pad or carrying cradle when handling pipe or iron rods

When carrying long lengths of pipe, iron rod and similar objects, a section cut from an old auto casing makes a good pad for the shoulder. If the section is slotted near the ends for a leather strap, it makes a cradle for carrying a number of small objects. Or, a stick can be substituted for the strap to provide a handle for men working in pairs when carrying heavy lengths.

Bicycle Spokes Tightened with Glass Cutter

I find that an ordinary cheap glass cutter makes a dandy bicycle-spoke wrench. The



smallest opening in the side of the cutter fits the spoke nuts, and the handle should be cut off so that the cutter will swing between the spokes. Also, the medium and large openings of the cutter can often be used on other

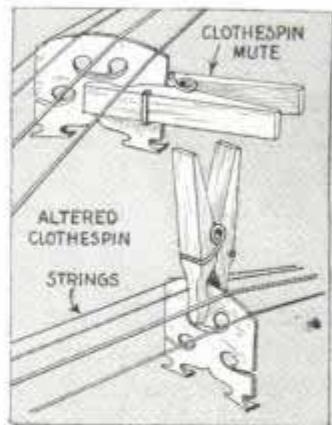
small nuts. In addition to these uses, the cutter comes in handy for cutting paper and cardboard patterns.

—Ira Munro, Brockville, Ont., Can.

Violin Muted with Clothespin

In order to mute my violin while practicing early in the morning, I found that a spring-type clothespin clipped to the bridge as indicated was highly effective, in fact it reduced the loudness of the tone about 75 per cent without affecting the quality of the notes. This idea is especially handy if your regular mute has been mislaid or is damaged.

—N. Jotikasthira, Bangkok, Siam.



Filaments of Photoflash Bulbs Tested with Neon Lamp

Here is a tester I use for testing filaments of photoflash bulbs to assure that they will flash. The tester is a small box containing two lamp sockets wired in series into which a $\frac{1}{2}$ -watt neon glow lamp



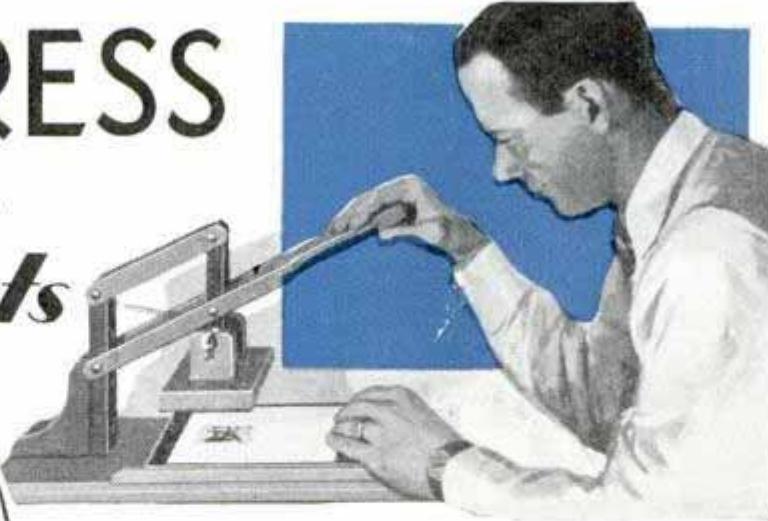
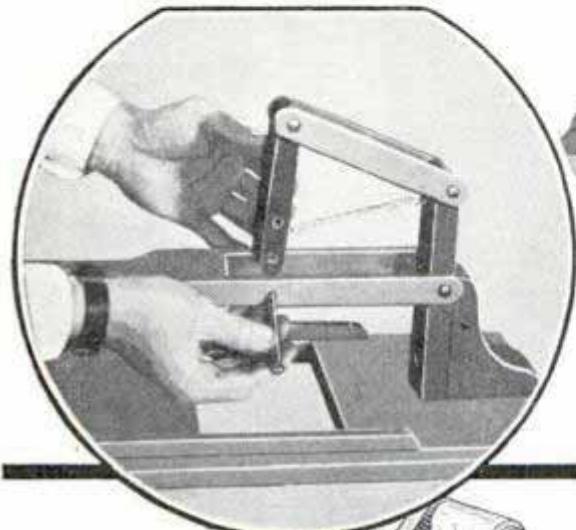
Neon lamp glows if bulb is good and passes insufficient current to flash it

and the bulb to be tested are inserted. If the filament of the photoflash bulb is in good condition, the neon lamp will glow. The neon lamp passes so little current that the bulb will not flash.

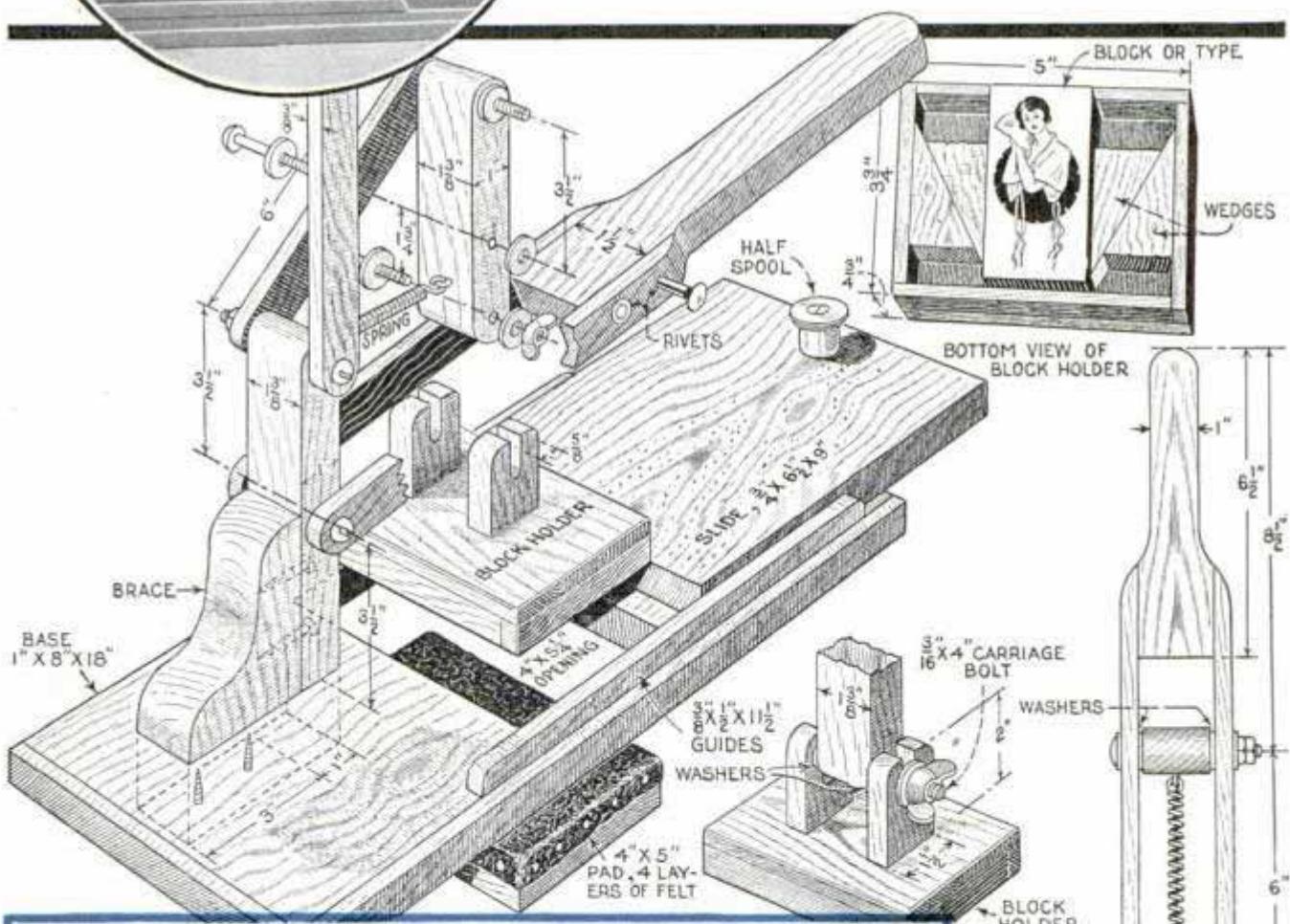
—Jas. A. Wilson, Kalamazoo, Mich.

HAND PRESS

*for type or
linoleum cuts*



Inking the cut is a simple matter with this hand press, and uniform pressure in printing is assured with the parallel-arm construction. The ink pad is inserted in the base opening and the type or cut in the holder is attached to the lifter. Inking is done on the pad by depressing the handle lightly. Then the paper on the slide is pushed into position under the cut and the handle is again lowered to make the impression



The parallel arm and the block holder are made of plywood, the balance of hardwood. Note that the base is cut away for the inking pad, which is a hardwood block covered with felt and a top layer of muslin tacked to the edges. The slide, or platen, should be a snug, sliding fit between the guides. To make the press work with an easy, smooth action, care should be taken in laying out and fitting the vertical and horizontal members of the parallel-arm mechanism and the block holder.

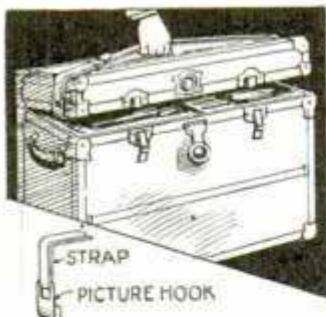
Screw-Top Cans Easily Opened with Pipe Handle



Plenty of leverage to loosen the screw top of a large can is provided with this handle

Slotted at one end and bent to the shape shown, a length of $\frac{3}{4}$ -in. pipe makes a good handle for opening the screw tops of carbide cans and similar containers. The slot fits over the flanged grip of the top and the handle gives considerable leverage for loosening the tops when they stick.

Trunk Fitted with Strap Handle for Lifting Lid



In cases where it is necessary to lift a trunk lid frequently, a long strap with hooks on the ends to clip under the edges of the lid will be found handy. The strap handle is quickly removed and stored in the trunk when the latter is to be transported.

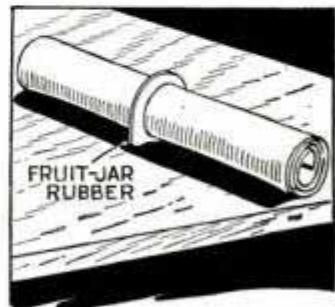
Improved Lighting for Enlargers

In some photo enlargers the negative is unevenly illuminated, the center receiving more light than the edges. This fault can be determined by placing a sheet of typewriter paper in the negative holder and exposing this on a sheet of enlarging paper enough to bring about a gray tone. A darker center on the paper shows up the lack of uniformity in the illumination. To

cure the trouble paint the reflector with aluminum paint, which has high reflecting quality yet does not give mirror reflection. Also paint the lower part of the light bulb, so that only reflected light reaches the diffusing glass.

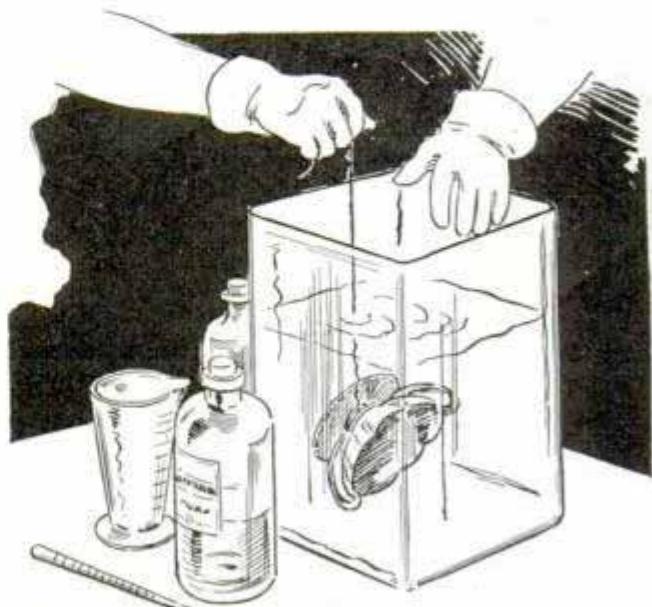
Rolled Blueprints Kept on Table by Fruit-Jar Rubbers

For keeping plans and blueprints from accidentally rolling off his worktable while not in use, one draftsman slips fruit-jar rubbers around the rolls. The ears on the rubbers prevent the plans from rolling and, at the same time, keep them compact.



Reddening Copper Articles

A simple method of reddening a copper-coated article is to suspend it in a 5 to 10-per-cent solution of potassium ferrocyanide (poison) and water. If a drop or two of hydrochloric acid is added to the solution, the copper will take a purple color. Leave the article in the solution from a few minutes to an hour, depending on the shade desired. Then remove it, rinse thoroughly in cold, running water to remove all the solution and dry it, after which a coat of wax polish finishes the job.



Copper-coated articles suspended in this acid solution quickly take on a red color



From COALBINS to PLAY ROOMS

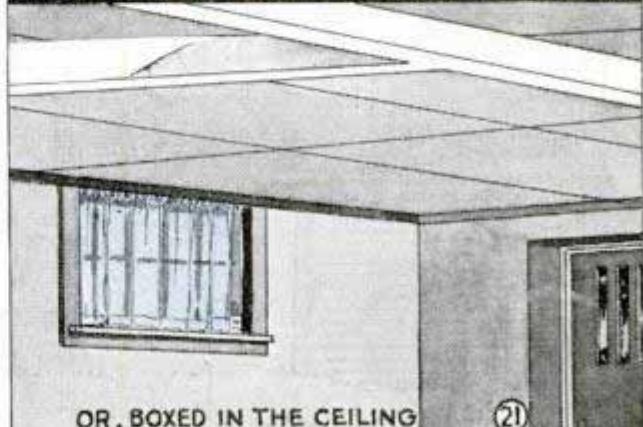
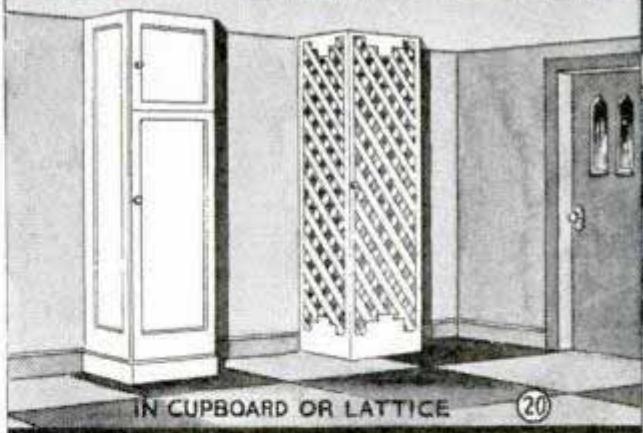
Part II

Unlimited treatment of floors, walls, windows, stairs, doors, pipes and lighting equipment enable you to create a novel and distinctive atmosphere

By R. O. BUCK

YOUR basement recreation room may be planned for play, study, sports, parties or just a place where you can follow your hobby undisturbed. If you design your room so that it is best fitted for the activities of your particular family group, your efforts will be well repaid. The illustrations of finished rooms in this and the previous article, show just how successfully the ideas of some people have been carried out. Even a small space may be made attractive and usable by a bit of ingenuity. Rooms designed for activity should have vigorous coloring. On the other hand subdued colors are best for rooms planned for study or rest. Remember also that the little details of decoration

Concealing Pipes

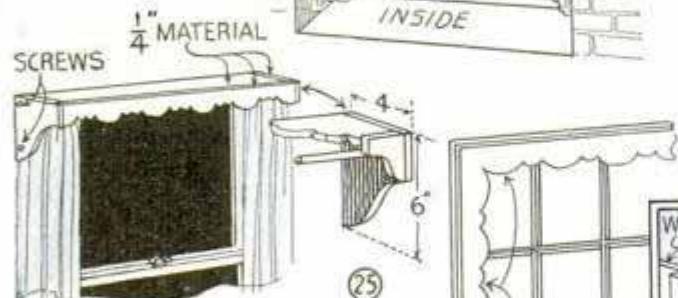




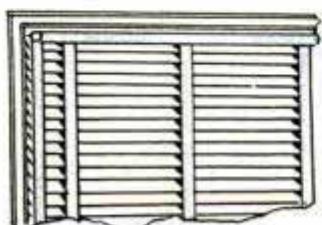
Enlarging Window Opening



Window Well with Steel Sash



SCROLL ACROSS TOP AND DOWN SIDES



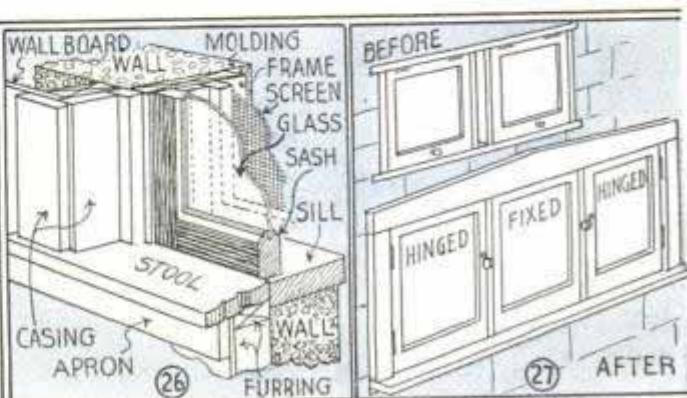
Valances and Venetian Blinds

and furnishing make a recreation room a place of real enjoyment. All of the fittings should be of a sort that can take abuse, and come back for more! A place where joy may be unrestrained.

For parties, the basement room is ideal, and a great saving on the upstairs furniture as well. The rest of the household is undisturbed by the noise, and the very atmosphere of the room gives a carefree character to the party. Then too, when the guests have departed there is no midnight "clean-up." You simply close the door and leave it to be put to rights at your leisure.

Concealing Pipes: Every basement presents its own problems in the matter of concealing pipes and ducts. Vertical pipes may be enclosed by building a cabinet or lattice over them as in Fig. 20. Pipes along the ceiling may be boxed in as in Fig. 21, or the ceiling dropped sufficiently so that they will be covered. If concealment of pipes is impractical, the pipes may simply be cleaned of rust with a wire brush, and painted.

Window Treatment: Good light and ventilation are as necessary in the basement as elsewhere in the house. This is especially true if you expect to spend long periods in the room, and wish to have it usable the year around. If the windows are small or too few in number they should be enlarged. Window ventilators of the fan type, to draw in fresh air and expel damp, musty air, may also be required. As moist air is heavy, it has a tendency to remain near the floor so that it is sometimes difficult to remove it by simply exhausting the air at window height. In this case the methods shown



BEFORE

BEFORE

BEFORE

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BEFORE

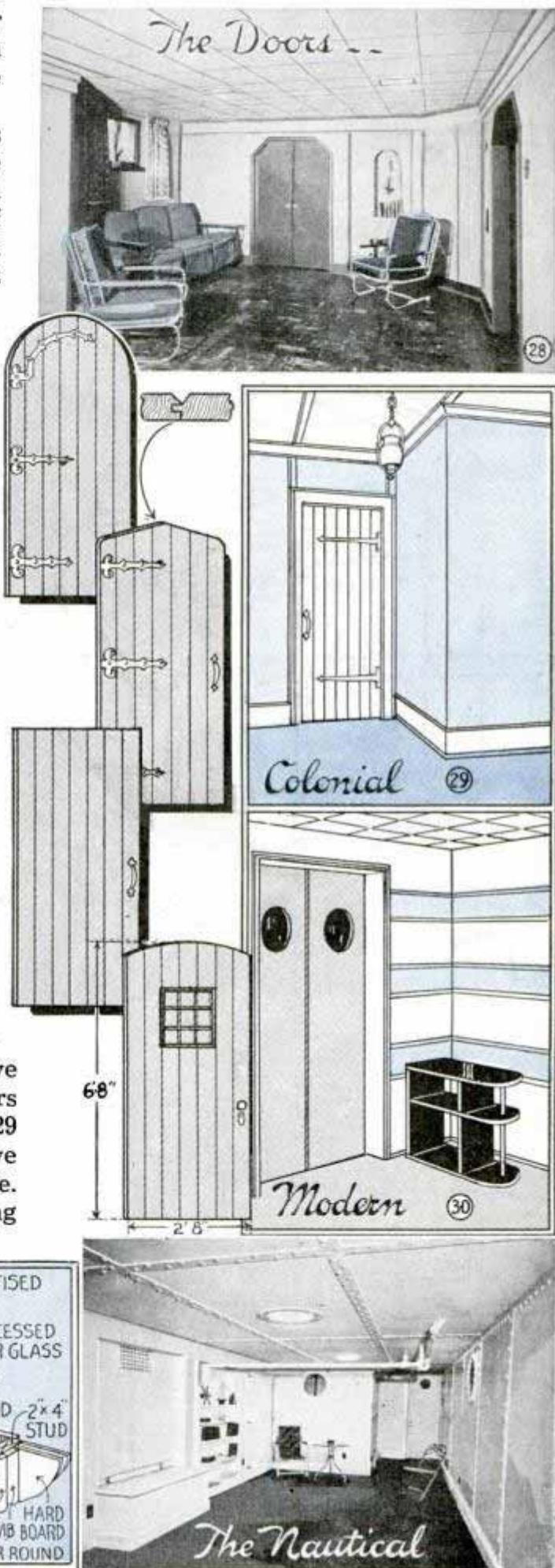
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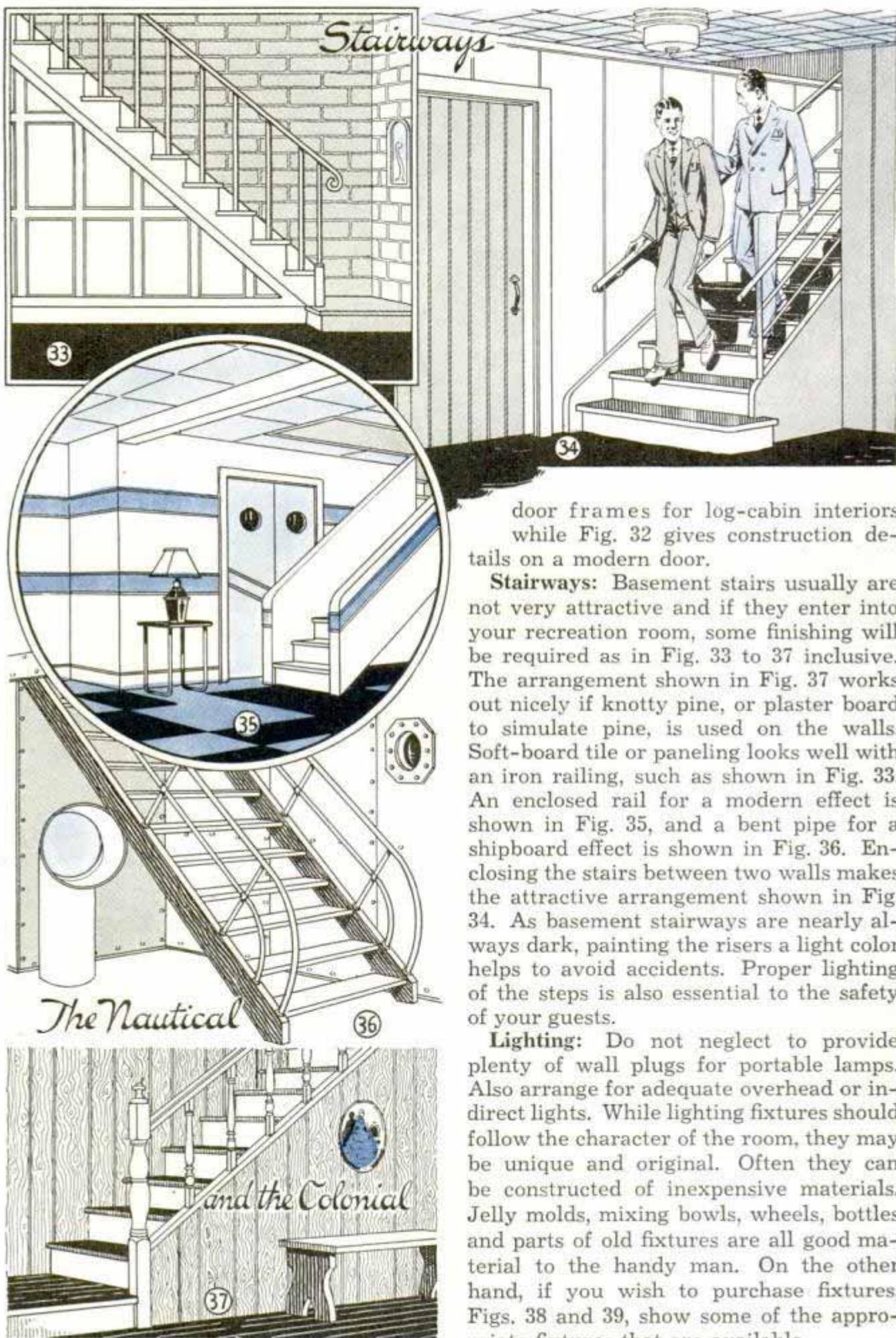
AFTER

in Fig. 19 of Part I and in Fig. 43 are suggested. The exhaust duct and blower may be concealed behind a partition, in a closet or lead from a imitation fireplace opening.

Enlarging the basement windows is generally quite simple, especially if the wall is framed. Even a masonry wall may be easily cut down to the level of the concrete wall with a chisel, as shown in Fig. 23, and a larger window frame set in. If the openings are fairly large and the bottom of the frame is well above grade, the swing-out type of steel sash can be installed. Windows close to grade may require a well in order to carry the window below grade, as shown in Fig. 24. In this case either a tilting window or swing-in type is recommended. If you have a double-mullion window, it may be converted into an attractive triple casement, as shown in Fig. 27, without enlarging the opening. Fig. 26 shows the method suggested for extending a window frame out to meet your new wall line, in case the present frame is not to be changed. This method makes the window appear larger and more attractive. The method of trimming the window will depend on the type of room you are planning. Figs. 22 and 25 suggest several possible treatments.

Doors: Your room will probably have one or more doors which should be in harmony with the decorations. Of course, doors may be purchased but in case you wish to build them, suggestions in Figs. 28, 29 and 30 may give you an idea. Fig. 28 shows double doors for a modern effect. At the left of Figs. 29 and 30 you will see a group of attractive batten doors that may suit your purpose. Fig. 31 suggests two methods of finishing



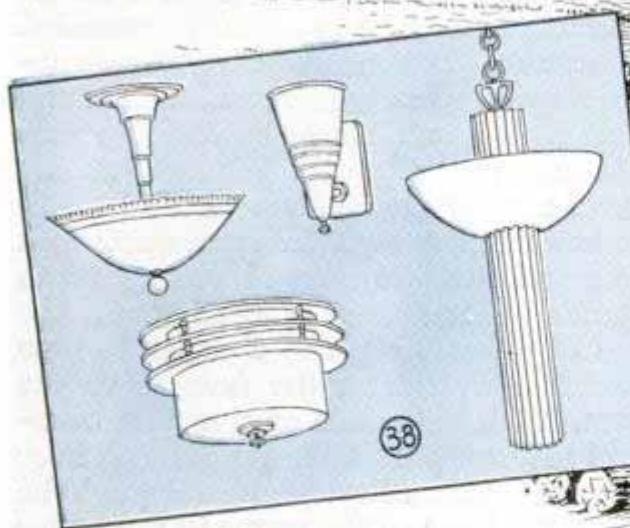


door frames for log-cabin interiors while Fig. 32 gives construction details on a modern door.

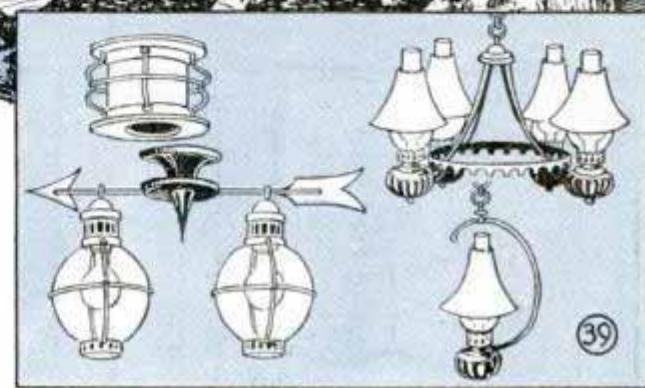
Stairways: Basement stairs usually are not very attractive and if they enter into your recreation room, some finishing will be required as in Fig. 33 to 37 inclusive. The arrangement shown in Fig. 37 works out nicely if knotty pine, or plaster board to simulate pine, is used on the walls. Soft-board tile or paneling looks well with an iron railing, such as shown in Fig. 33. An enclosed rail for a modern effect is shown in Fig. 35, and a bent pipe for a shipboard effect is shown in Fig. 36. Enclosing the stairs between two walls makes the attractive arrangement shown in Fig. 34. As basement stairways are nearly always dark, painting the risers a light color helps to avoid accidents. Proper lighting of the steps is also essential to the safety of your guests.

Lighting: Do not neglect to provide plenty of wall plugs for portable lamps. Also arrange for adequate overhead or indirect lights. While lighting fixtures should follow the character of the room, they may be unique and original. Often they can be constructed of inexpensive materials. Jelly molds, mixing bowls, wheels, bottles and parts of old fixtures are all good material to the handy man. On the other hand, if you wish to purchase fixtures, Figs. 38 and 39, show some of the appropriate fixtures that are available.

Suggested Lighting Fixtures



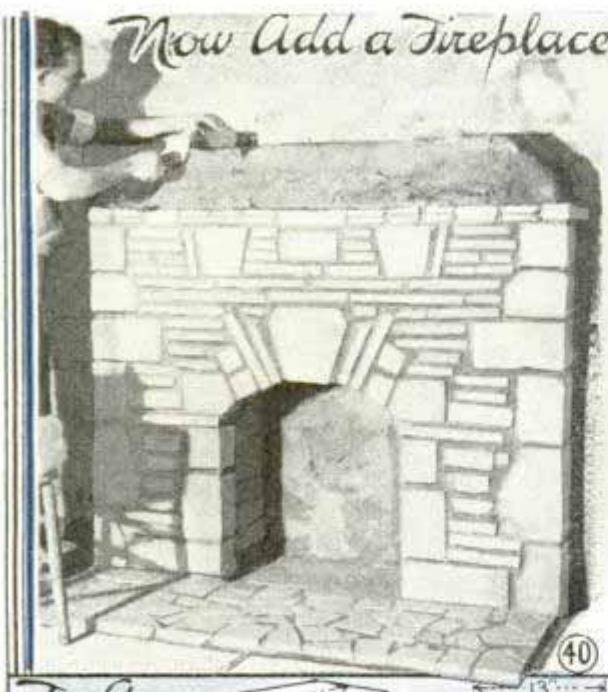
Fireplaces: There are few things that add so much to a recreation room as a fireplace. They are always associated with warmth and good cheer, which are the very attractions you want to build into your room. Fireplaces may be divided into three groups: The purely ornamental electric type, realistic and cheerful appearing nevertheless; the gas, using a radiant heating unit, by means of which considerable heat is sent into the room, and the natural wood and coal-burning sort. If your fireplace is purely for atmosphere, the electric type will serve your purpose. As the material does not need to be fireproof, blocks of soft board, nailed to a wood frame, will do very well. A mortar joint is simulated by chamfering the edges of adjacent blocks. Plastic paint, in a rough finish of suitable color is used to give a stonelike surface. Fig. 42 shows an attractive example of the type that is built out into the room. If you do not wish to sacrifice this much of your floor space, the scheme shown in Fig. 41 can be adapted. This is applicable only where the fireplace is to be located on a partition wall. A realistic stone effect can be obtained for a fireplace by cutting the soft board in random shapes on a bandsaw and roughing the faces to an irregular surface with a rasp, then painting as already described. Sand worked into the paint carries out the illusion still more. An iron door and a piece of linoleum in a flagstone design, for a hearth, complete the fireplace. Electric log units may be purchased in which a colored light and a disk, which is caused to



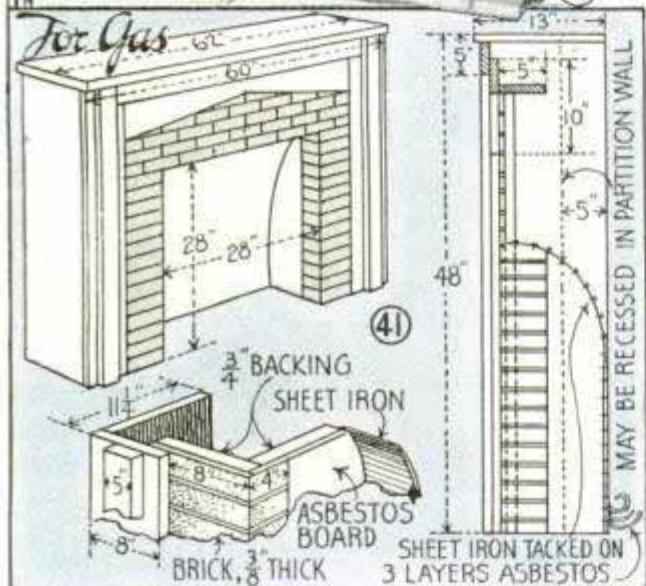
rotate by the heat of the lamp, are concealed behind amber and red-colored chunks of glass resembling burning coal. The effect is surprisingly realistic. Gas-type fireplaces need not be of brick or stone construction if a radiant fire unit is used, nor is a flue connection essential, though it is generally desirable. Fig. 41 shows the method employed. For brick, asphalt or asbestos wall covering, in a brick pattern or the real brick facing on asphalt type of siding may be used. Asbestos paper and sheet iron are sufficient protection to the wood frame as there is only a small amount of heat thrown off from the back of the unit.

Neither the electric nor gas type of fireplace can compare with a natural fireplace for real enjoyment. If you have an oil or gas burner in your heating plant, and the chimney is used only as a vent, it is quite possible that a natural fireplace in your basement is entirely practical. However, before you go ahead it would be well to get the expert advice of the manufacturer of your heating equipment as the installation of a natural fireplace may in some

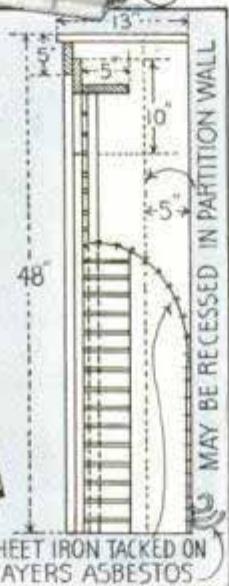
Now Add a Fireplace



40



41

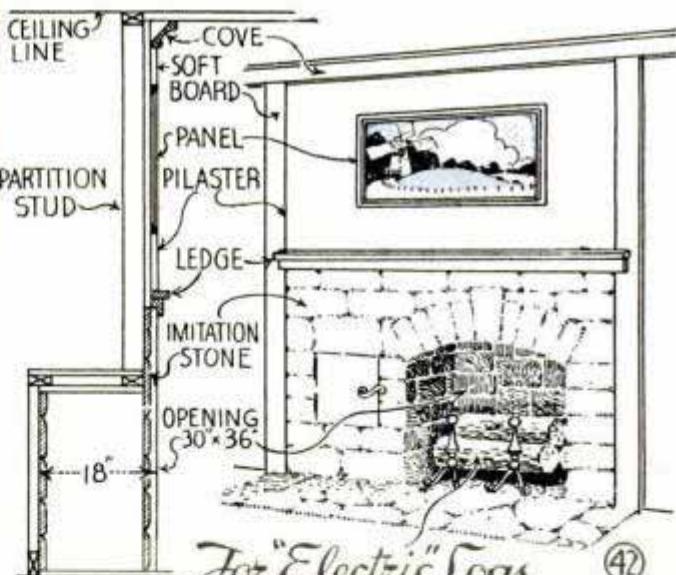


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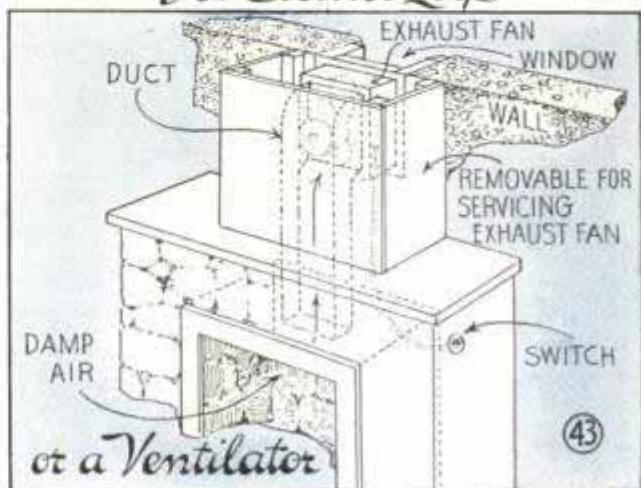
cases, interfere with its operation. Building a good fireplace depends on several factors involving its design. The subject has been covered in bulletin No. 1230 of the U. S. Department of Agriculture which will enable anyone with a bit of masonry experience to do the job. Should you feel doubtful of your ability to construct a proper throat and shelf, in which lies the secret of a good drawing fireplace, you may purchase a metal throat which requires only covering with brick, as indicated in the manufacturer's directions. Fig. 40 shows the construction of an attractive stone front design.

Heating: Now in the matter of heating it should be decided just how you are to heat your recreation room, in case a natural fireplace is not to be built. If your heating plant keeps the basement com-

fortably warm in the coldest weather, a lattice grille built in a partition may be the solution. If the heating plant is within the room it may be practically concealed by means of a lattice structure. This structure may completely surround the heating plant with a suitable grille door, so that heat may pass through. Modern heating plants usually give off very little heat in the basement, except that from uncovered pipes and ducts, so it may be necessary to provide other means of heating. In the case of a hot-air plant, a separate pipe should be run from the furnace to the room. With hot water or steam an overhead radiator serves the purpose. A floor radiator is impractical because it would be below the level of the water in the boiler and so would not circulate properly. If none of these methods solves your problem, or if your heating plant is already taxed to the limit to heat the upper floors, then the installation of a gas-steam radiator is recommended. This is a self-contained unit requiring only a gas connection.



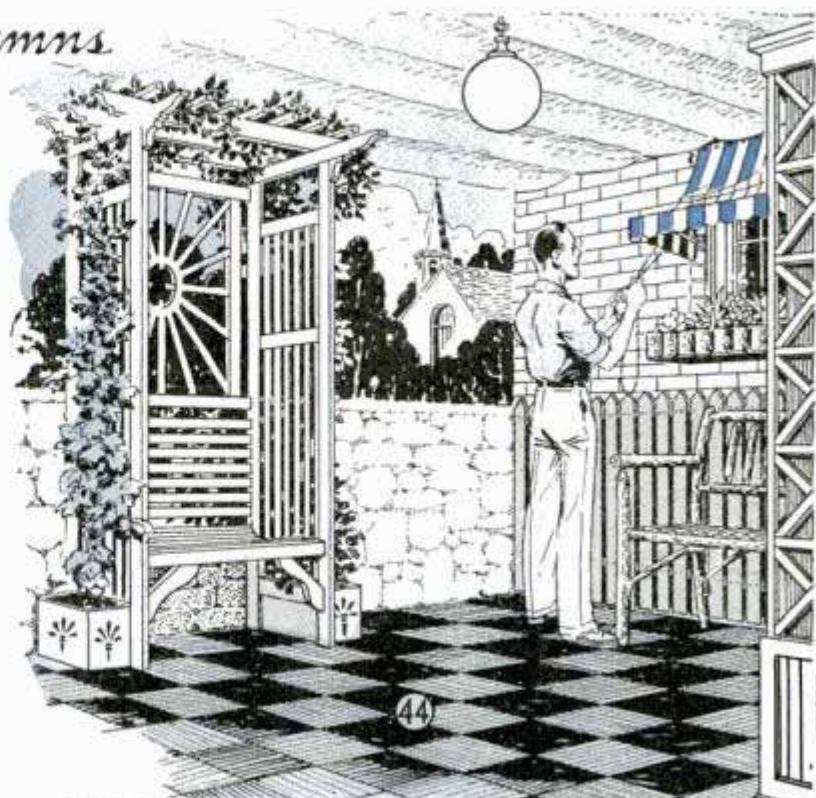
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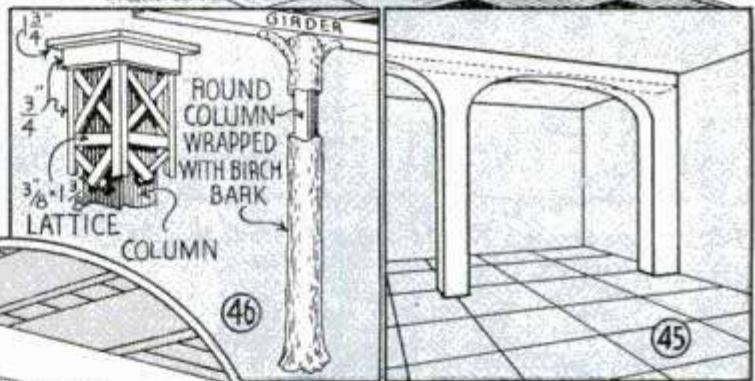
~and Finish off the Columns

Trusses and Columns: Columns can nearly always be effectively worked into the decorative scheme by some simple treatment which is in harmony with the general arrangement. Figs. 45 to 49 inclusive give suggestions for obtaining various effects by covering columns. The tree-trunk effect shown in Fig. 46 goes well with imitation garden and log-cabin interiors.

General Procedure: If you take the room illustrated in Fig. 44 as an example of general procedure, and assuming that you want to enjoy a garden atmosphere the year around, first cover the ceiling with unbleached muslin and top floor with green cement, marked off in squares for a tile effect. The window shown is in a partition, and is not glazed. This permits the entrance of heat from the adjacent furnace room. Blue lights are mounted just out of sight below the window sill, on the outside, to give a twilight effect. Artificial flowers and vines are



44

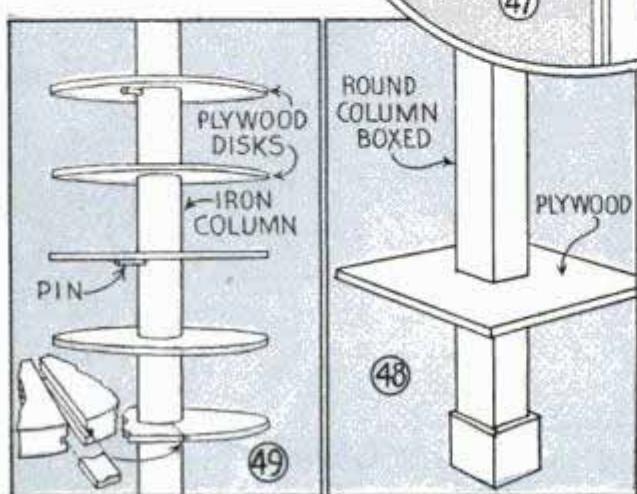


45

Column Treatments

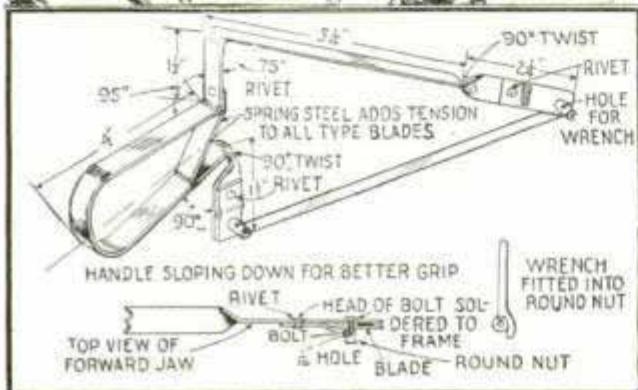
used for the boxes and arbor. The stone effect is painted on the concrete wall with a distant landscape, in grays and blacks on wallboard above, to produce the illusion of looking over the garden wall. The remainder of the room is furnished with rustic furniture.

The whole arrangement presents a remarkably attractive and realistic effect. In working out any motif, the type of room desired must first be decided on. When this has been decided, the available space should be laid out on squared paper, to scale, and all of the things you wish to include in the room, such as game tables, benches, cupboards, etc., carefully fitted on it. In this way you will be assured an attractive and usable room.



49

This Scroll Saw for Modelmakers Handles Unusual Work

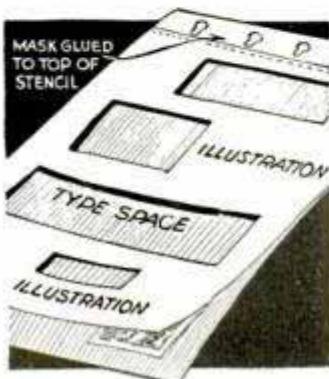


Simple saw frame will hold any type blade from a jeweler's to a hack-saw blade

Holding any type of scroll-saw blade, this light frame is easy to handle, keeps the blade under strong tension and cuts into small places. It is made from a piece of sheet brass $\frac{1}{16}$ by $\frac{1}{2}$ by $24\frac{1}{2}$ in., which is bent to the shape shown and fitted with a piece of spring brass or steel riveted in place between the handles to maintain the tension on the blade.

—S. H. McElroy, Baltimore, Md.

Mask for Mimeograph Stencils Simplifies Typing



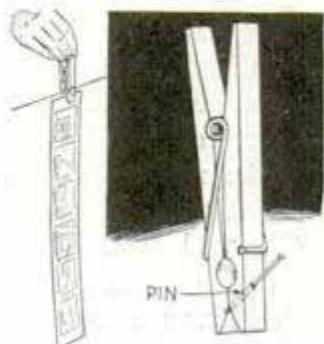
When cutting a mimeograph stencil which is to contain both copy and illustrations, one typist makes up a dummy sheet first and uses it as a mask to assure that the spaces on the stencil are

correctly proportioned. As the illustrations are usually cut first, spaces for the type are cut out of the dummy, which is glued to the top edge of the stencil. The assembly is then slipped into the typewriter and the typing done through the "windows."

Clothespin Film Holder Improved by Common Bank Pin

If you use spring-type clothespins to hold your films while drying, you can further assure a good grip on the negatives by fitting the clothespins with pins as shown. Each clothespin is slipped over the margin of the negative so that the pin puncture will not damage it.

—R. M. Eadie, Granum, Alberta, Can.



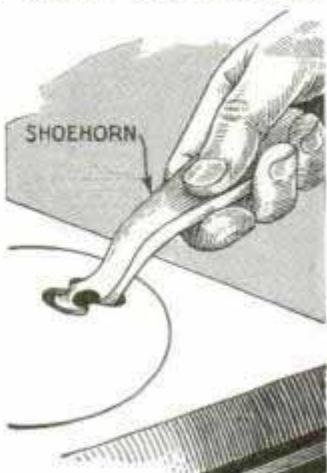
Preventing Drill Marks on Work



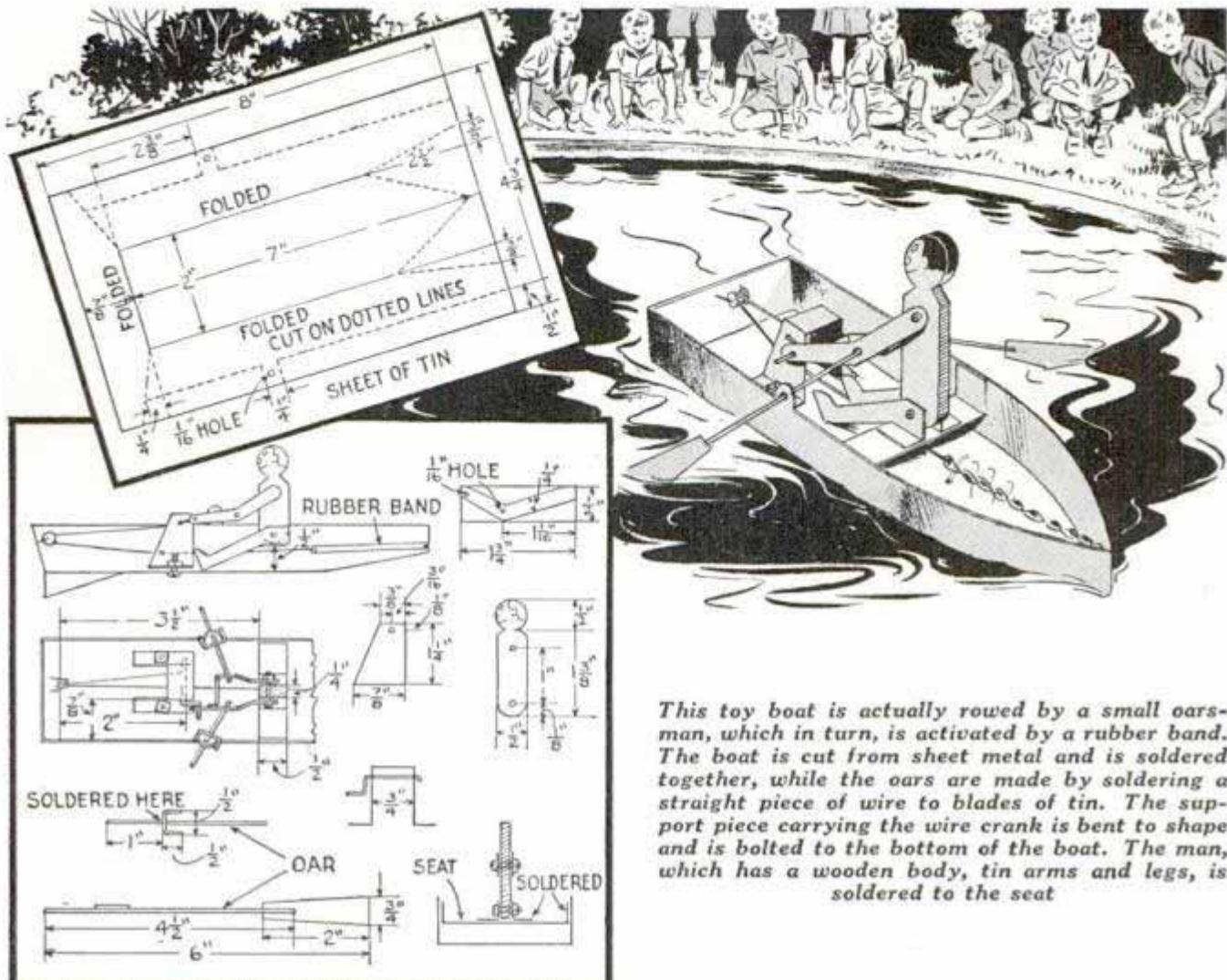
Slipped over a drill bit as indicated, a short piece of rubber tubing serves as a cushion to prevent the chuck from touching the work and marring it when the drill suddenly breaks through. This is especially handy when using a brace or a hand drill.

Stove-Lid Lifter from Shoehorn

If you break or misplace your stove-lid lifter, a shoehorn will serve as a substitute until another one can be obtained. It is best to remove the shoehorn from the lid when not needed to prevent it from getting hot.



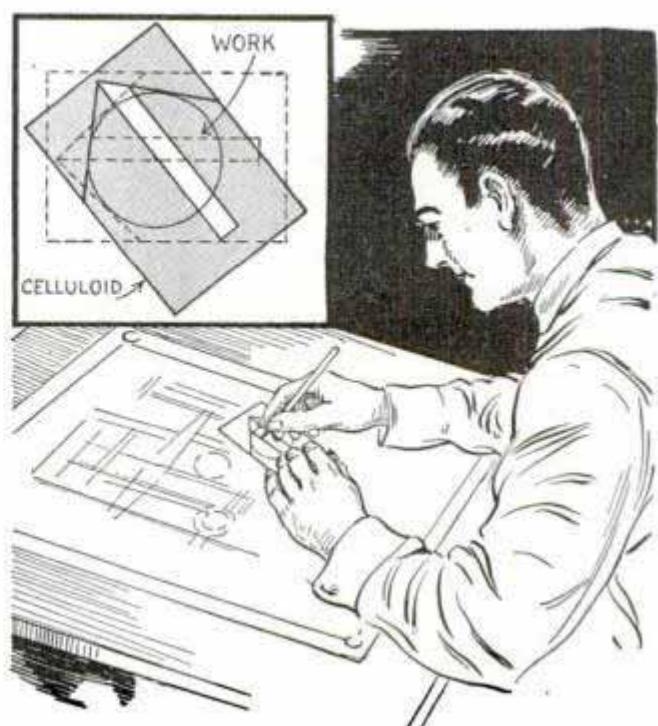
Midget Oarsman Works This Toy Rowboat



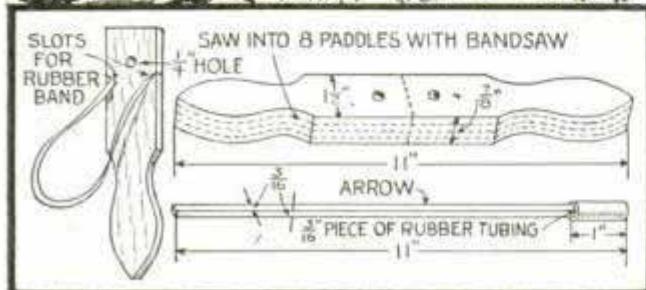
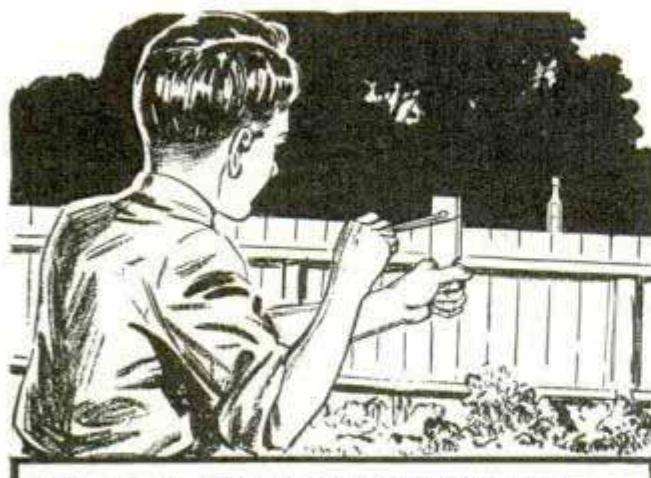
This toy boat is actually rowed by a small oarsman, which in turn, is activated by a rubber band. The boat is cut from sheet metal and is soldered together, while the oars are made by soldering a straight piece of wire to blades of tin. The support piece carrying the wire crank is bent to shape and is bolted to the bottom of the boat. The man, which has a wooden body, tin arms and legs, is soldered to the seat.

Finding the Center of Circles Without Rule or Compass

Finding the center of a circle is easy with this simple instrument. It consists of a rectangular sheet of thin, transparent celluloid on which is drawn a right angle in the position shown. Score the lines and ink them so that they are easily seen. Divide the angle in half, locating two 45° points. Then along a line drawn between the points, cut through the celluloid with a sharp knife, guiding it with a straight-edge. Make another cut parallel to the first and cut out the waste, leaving a slot about $\frac{5}{16}$ in. wide. In use, place the instrument over the circle with the right-angle lines tangent to the circle. Then draw a line across the circle, using the long side of the slot as a guide. Shift the instrument 90° , place it in the same relative position and draw a second line which will intersect the first one. The point of intersection is the center of the circle.



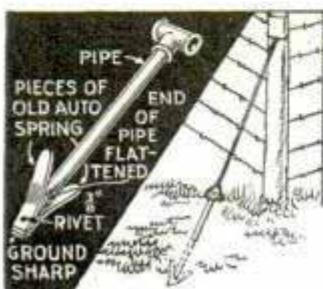
Rubber-Band Gun Shoots Arrow Several Hundred Feet



Making these guns in quantities and selling them to merchants offers the craftsman a neat profit

Easily produced in quantities, these guns offer the home craftsman a chance at spare-time profits by making them up and selling them to merchants and manufacturers for prizes with their products. Cutting eight at a time, you can turn out a large number an hour on the average band saw. White pine is used, and a $\frac{7}{8}$ -in. piece 11 in. long is sawed to the shape shown and drilled, after which it is ripped into four $\frac{3}{16}$ -in. strips on the band saw. Then the strips are stacked, the slots for the rubber band made and the stack cut in half. The arrows, which are also 11 in. long, can be sawed out a number at a time by stacking several thicknesses of the stock, and it's merely a matter of seconds to tip them with inch lengths of rubber tubing.—Dale R. Van Horn, Lincoln, Nebr.

"Hold-Fast" Fence-Post Anchor

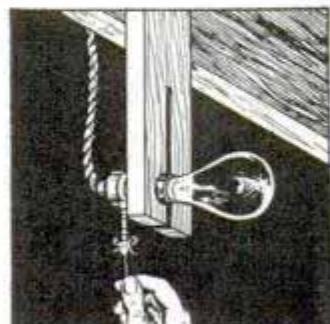


This fence-post anchor is easy to drive and will not slip as the greater the pull against it, the harder the lips or "wings" will bite into the

ground. Made from a length of $\frac{3}{4}$ -in. pipe and a tee, the anchor has the lower end flattened and the lips of old auto spring or heavy flat iron riveted to it as shown.

Pull-Chain Lamp Socket Held on Wooden Arm

A firm mounting for a lamp having a pull-chain socket is obtained by suspending it from a ceiling joist with a wooden arm as shown. A hole slightly less in diameter than the small end of the socket is bored near the lower end of the arm, which is slotted right through the hole. The slot permits the arm to be spread to take the socket, and when released, it grips it securely.



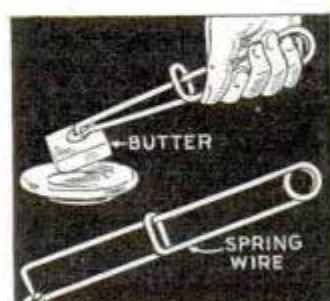
Cutting Crepe-Paper Streamers



When you want a number of crepe-paper streamers, just roll the paper tightly and with a plane iron or similar sharp-edge tool, cut the roll in pieces as indicated. This should be done on a wood block to avoid damaging the tool.

Fork to Handle Butter Squares

For handling butter squares, this fork has an advantage over the usual table fork in that it drops the square when the grip of the hand is released. The fork is made from a length of spring wire bent to the shape shown with one end pointed and bent at right angles to form a prong, which passes through an eye formed on the other end when the handles are closed.



MOTORBOAT EQUIPMENT

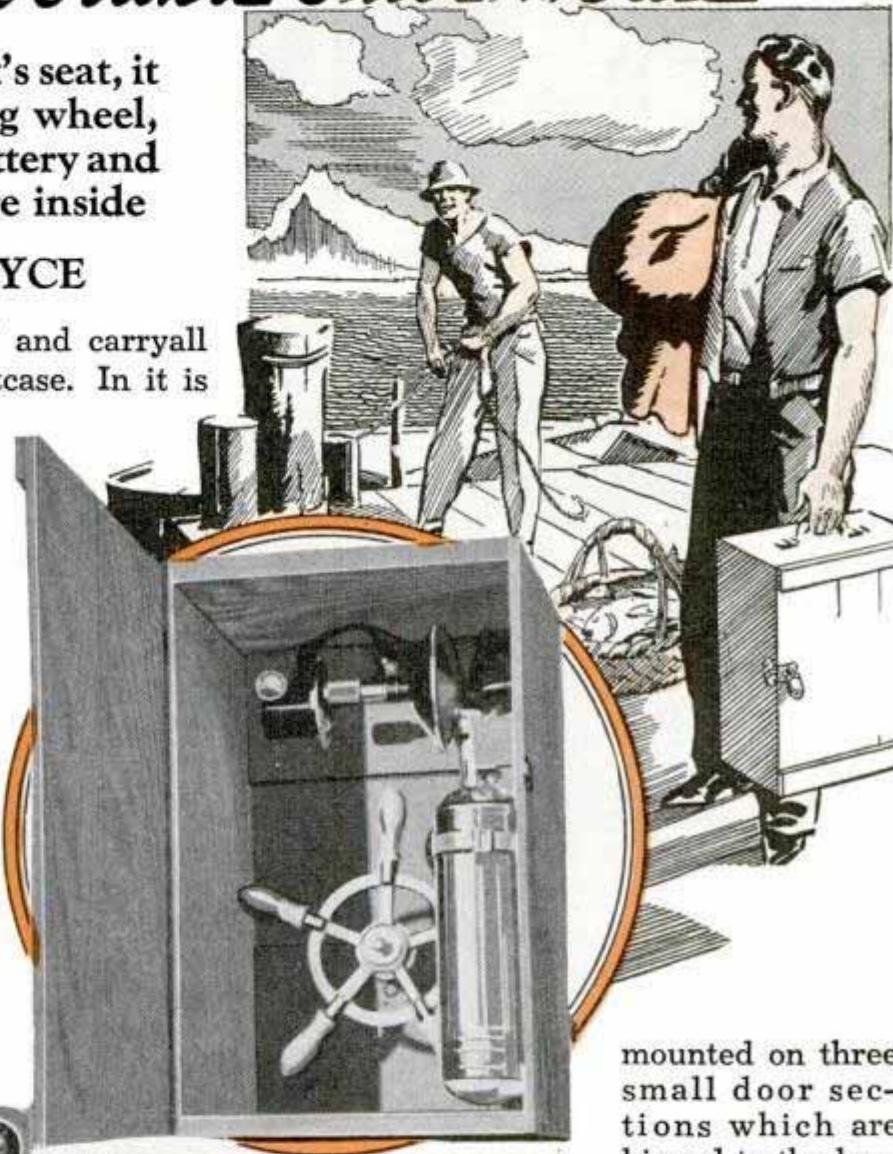
in Portable "Pilot House"

Clamped to the pilot's seat, it supports the steering wheel, lights and horn. Battery and other accessories are inside

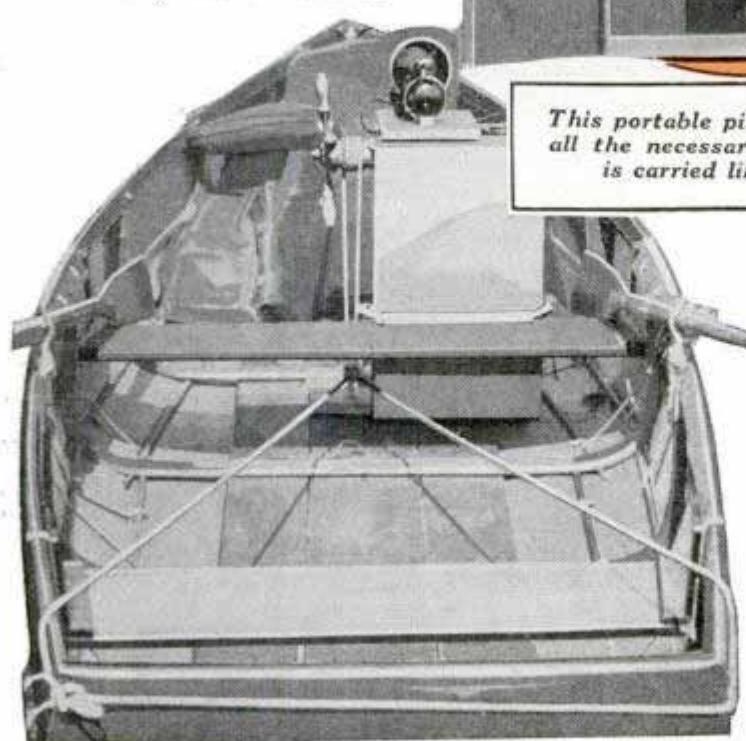
By C. P. FORDYCE

THIS midget "pilothouse" and carryall folds up just like a suitcase. In it is contained the equipment required by regulations governing the operation of motorboats—a white light for the transom, a red and green running light, pressure-type motorcycle horn, life-preserved jacket, a fire extinguisher, two copies of the pilot rules, and a steering gear. You have to register your boat to receive an identification letter and number, both of which must be painted on the bows of the craft.

The carryall consists of three separate units

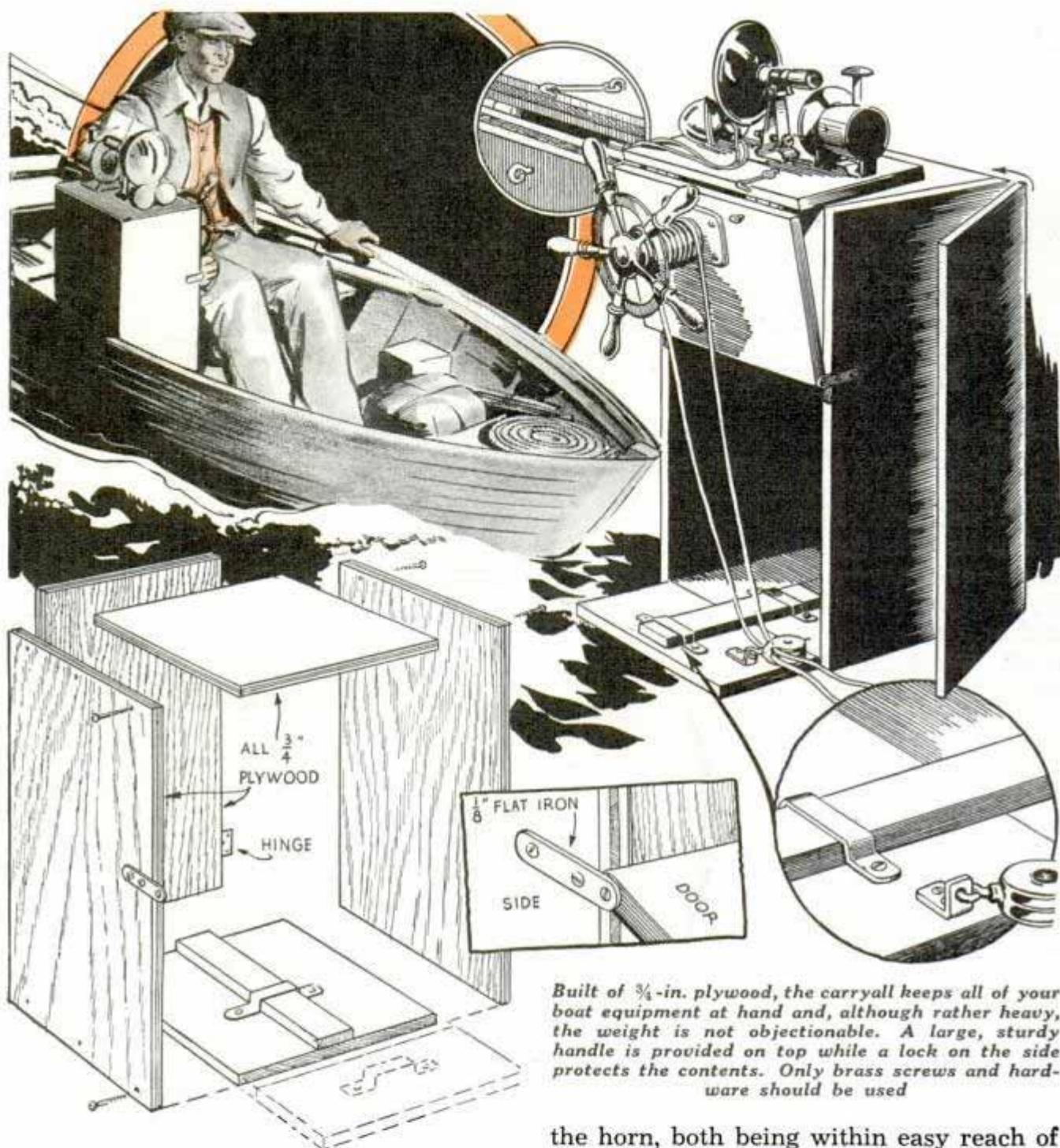


This portable pilothouse contains all the necessary equipment. It is carried like a suitcase



mounted on three small door sections which are hinged to the box. The first door section carries the lighting unit, the second the steering wheel and gear

and the last a pulley unit, as you will see from the illustrations. When the box doors are closed and latched, all units are folded into the box for portability. When opened, the pulley unit is held horizontally by means of a sliding strip. The other two units are brought to a perpendicular position on the top of the box and then the lighting unit is folded over on top of the box, where it is held rigidly with hooks. The one-piece door of



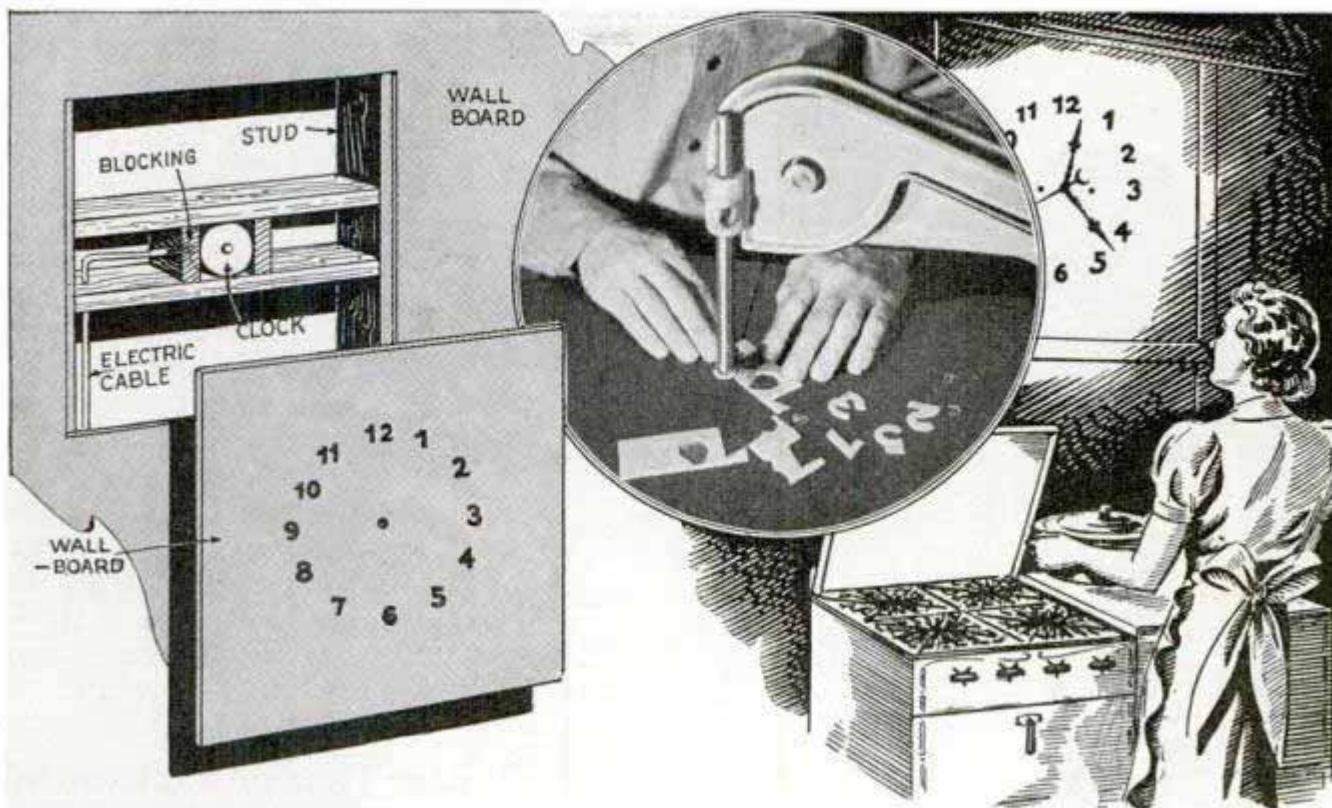
Built of $\frac{3}{4}$ -in. plywood, the carryall keeps all of your boat equipment at hand and, although rather heavy, the weight is not objectionable. A large, sturdy handle is provided on top while a lock on the side protects the contents. Only brass screws and hardware should be used

the opposite side is folded back and set against the front boat seat. A strip 2 in. longer than the door width is clamped to the boat seat, and, with other clamps, to the box door. Thus the arrangement can be used with seats of varying height.

The lighting unit consists of the combination lamps showing green to starboard and red to port, and is so placed that it throws the light from directly ahead to two points abaft the beam. Wires from the lamps are run to a 6-volt dry-cell battery or a small 6-volt storage battery contained in the box. There is room behind the lights for a small auto-type spotlight and

the horn, both being within easy reach of the steersman. The former is not a specified item, but is really essential for safe night cruising. The steering gear is mounted on the center door, as you see it in the illustrations. The cables run to a double swivel pulley on the lower door, which is held against the floor of the boat by the sliding strip. From here the cables run directly back to the motor, or you can run them through an extra set of swivel pulleys placed so that the lines will be parallel to the sides of the boat back of the seat. Even though you make the carryall of sufficient size to accommodate one or two life-preserver jackets and a 2-gal. can of fuel, its weight will not be objectionable.

Built-In Kitchen Clock Uses Wall for Dial



Without the dial, the electric movement for this built-in kitchen clock costs no more than the ordinary alarm clock. There's no case to make—only the numerals and the dial.

It's built in the wall between the studs just as you install a medicine cabinet. The electric movement is of the type allowing the use of dials up to $\frac{1}{2}$ in. thick, the hands being large enough to reach a minute circle 10 or 12 in. in diameter. To install the movement you cut a square opening between the studs, nail in two horizontal strips the same width as the studs

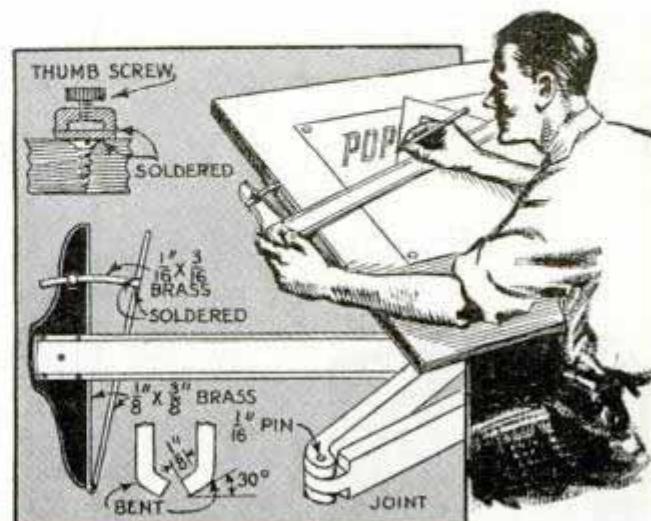
and then fit the movement between two small blocks as shown. Numerals can be cut from thin plywood or $\frac{1}{32}$ -in. sheet brass and fastened to the wallboard face with glue or small brads clinched on the back. After assembling with the face and hands in place, a molding will finish up the job nicely.

—D. C. Marshall, Manhattan, Kans.

How to Make Your T-Square Adjustable for Slant Lettering

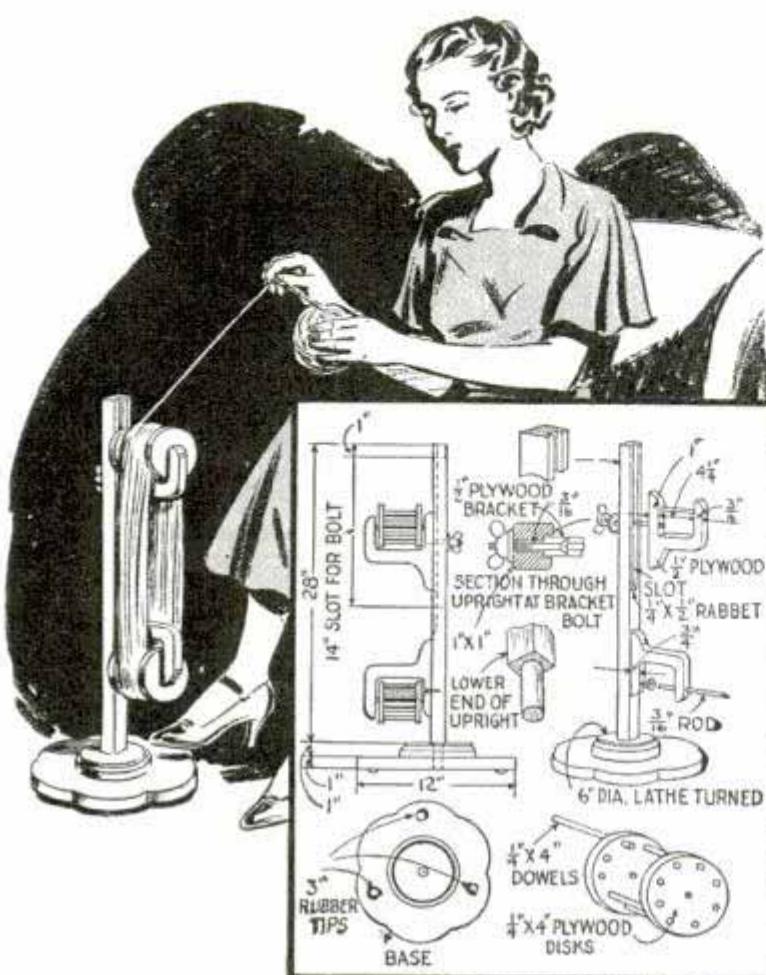
Here is a simple method of fitting your T-square with an angle adjustment, which will aid in making slant lettering and similar work. The attachment consists of two narrow brass strips hinged together at one end. You can follow the construction indicated or use a hinge from a broken folding rule. One strip is screwed to the edge of the square while the other is fitted with a curved arm, which slides through a simple locking device fastened to the head of the square. The arm is graduated so that adjustment for any desired angle may be obtained, and the thumbscrew on the locking unit is then turned tight.

—Paul H. Smith, Charlestown, Mass.



Screwed to the head of a T-square, this homemade attachment permits setting at any angle.

This Reel Enables Knitters to Wind Yarn Single-Handed



With this adjustable reel, you can wind skeins of yarn into balls quickly and easily

With its adjustable top roller to accommodate skeins of different sizes, this sturdy yarn reel eliminates the necessity of a second person holding the skein over the hand while it is being wound into a ball. The reel has a base of 1-in. pine and a 1 by 1-in. standard, recessed to form a track for the sliding bracket, and slotted for the bracket bolt to permit adjustment. Both brackets, which are made of $\frac{1}{2}$ -in. plywood, are identical except that the upper one is $\frac{1}{4}$ in. wider than the lower one.

Coffee Absorbs Cooking Odors



Placed on a lid inverted over a kettle in which cabbage, cauliflower or similar vegetables are being cooked, a tablespoonful of freshly ground

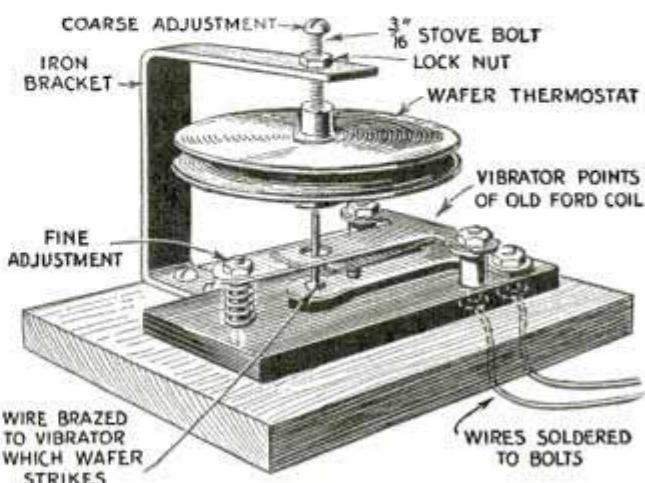
coffee will absorb the odors to a certain extent. The lid should be set slightly to one side so the steam will tend to curl over the coffee.

Cleaning Dirty Hairbrush

When the bristles of a hairbrush become soft and lifeless, they may be partially restored to their original condition by cleaning them well and dipping them in cold water to which a small amount of alum has been added. To clean a brush, swish the bristles through clean water to which a little baking soda has been added. Do not use soap or hot water and be careful not to wet the back of the brush. Then rinse it thoroughly, shake it vigorously and dry with the bristles down.

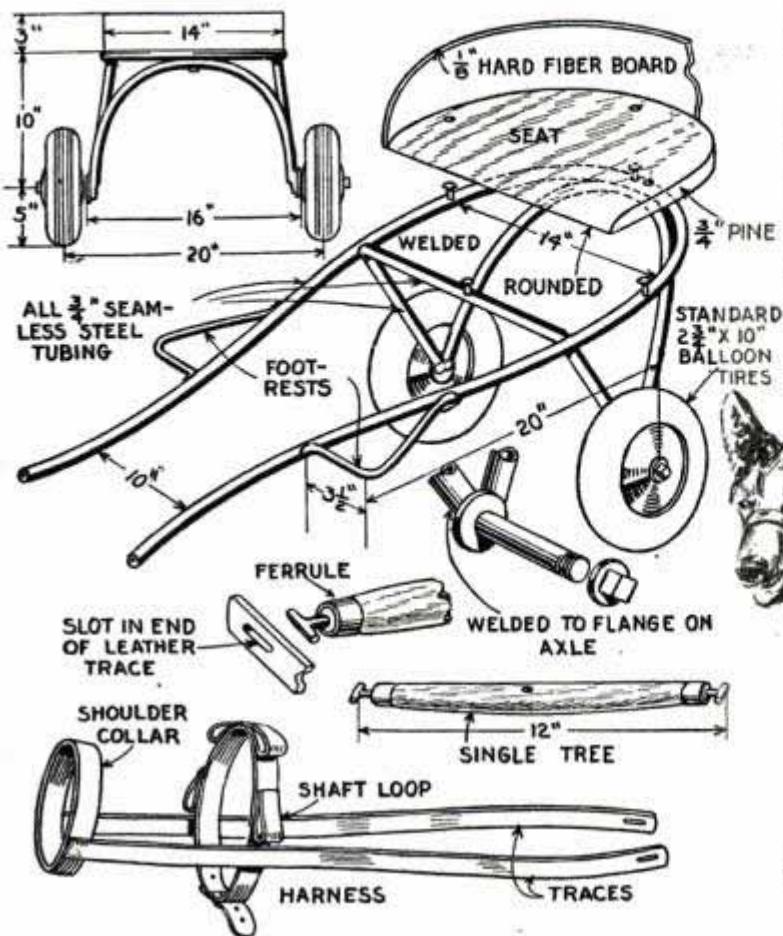
Wafer Thermostat Control for Electrical Devices

For operating electrically heated brooders and similar devices where changes in temperature is the controlling factor, a sensitive thermostat can be made from a cheap wafer thermostat and the vibrating points from an old Ford coil. The thermostat has two adjustments, a coarse one obtained by raising or lowering the wafer with a stove bolt which attaches it to a supporting arm, and a fine one obtained by the regular adjustment on the points.



A slight change in temperature causes this thermostat to open or close an electrical circuit

Dog Racing Sulky Fitted with Balloon Tires



Light and strong, this sulky is easy to make from seamless steel tubing, which is heated with a blow-torch and bent in a vise. Any garage having welding equipment will do the job of joining the parts at a nominal charge. Although the dimensions given were suitable for a police dog, the shafts and harness should be adapted to the size of the dog. Balloon-tired wheels fitted with ball bearings give a smooth ride and, as the seat is placed a trifle behind the center of the wheels, the animal carries very little of the driver's weight. A singletree is important as it allows the tugs to move back and forth as the dog runs without chafing his chest.

Tears in Cushions Sewed so That Threads Won't Pull Out

When an upholstered spring cushion has a tear and the fabric is pulled apart by the under-padding so that it is difficult to close neatly, try the following method of repairing it: First make long stitches across the opening. Then pull them up, gradually drawing the torn edges of the cloth together. When the edges overlap slightly, sew them together with thread that matches the cloth, taking neat, small stitches, close together, as in the lower detail, after which the long stitches are removed.—G. E. Hendrickson, Argyle, Wis.

Water stains on glass pitchers, vases and aquariums usually can be removed by rubbing them vigorously with a piece of freshly cut potato or a cloth which has been moistened with potato juice.



Sawhorse with Heavy Iron Base Does Not Tip Easily

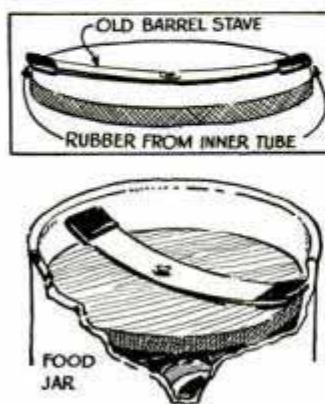


Two lengths of pipe, two floor flanges, an auto cylinder head and a plank make this sawhorse

Needing some sawhorses that would not tip or move easily, one mechanic made them as shown. The bases are old auto cylinder heads and the standards are lengths of pipe attached to the 2 by 4-in. cross members with floor flanges. The standards are set in the spark-plug holes in the cylinder heads and, if desired, can be threaded to screw into them.

Pickling Jar Has Spring Lid to Keep Contents in Brine

In home preserving of meats and other foodstuffs in pickling jars, the problem of



providing a cover that holds the contents under the brine, yet is easily removed, is solved with this simple, spring friction cover. Instead of weighting it, a length of barrel stave is screwed to its center as shown, after which

strips of inner tube are fastened over the ends. When the cover is pressed down,

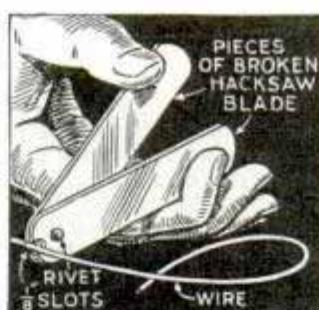
friction between the jar sides and the rubber will hold the cover firmly. A light pull on the ends of the stave releases it.

Vacuum-Cleaner Nozzle Shielded to Protect Furniture

To prevent accidentally marring your furniture with the vacuum-cleaner nozzle, shield it with rubber. A neat job can be done by using the rubber from an old inner tube if it is carefully cut to shape. Rubber cement is applied to the rubber and the metal, and when nearly dry the two are pressed together.



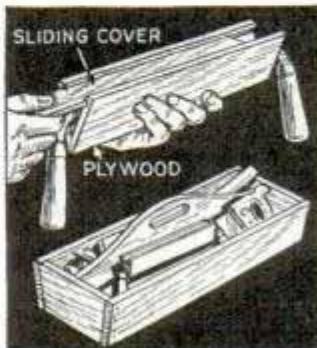
Vest-Pocket Wire Cutter Is Made from Hacksaw Blade



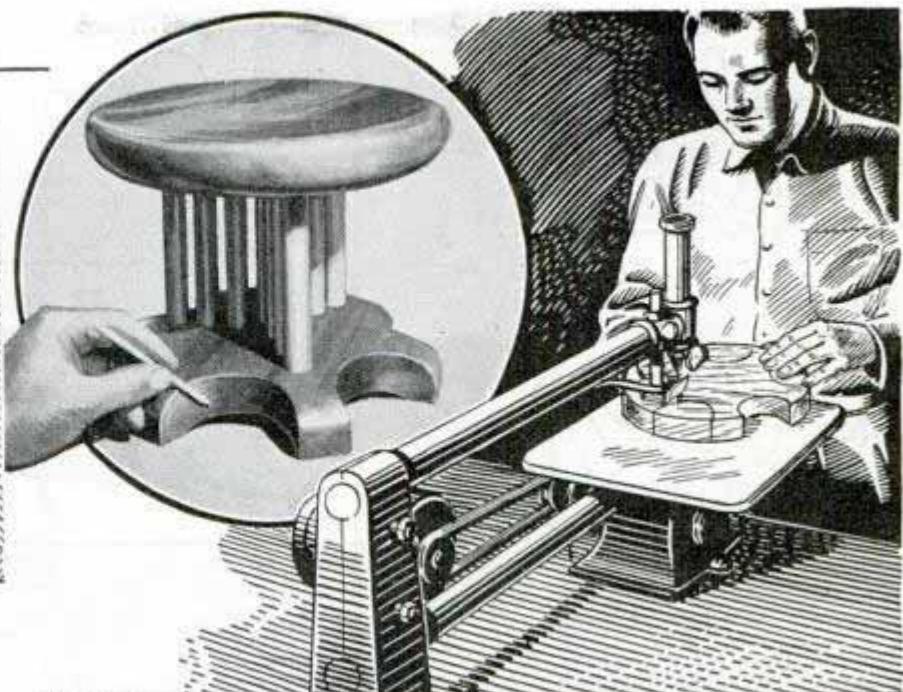
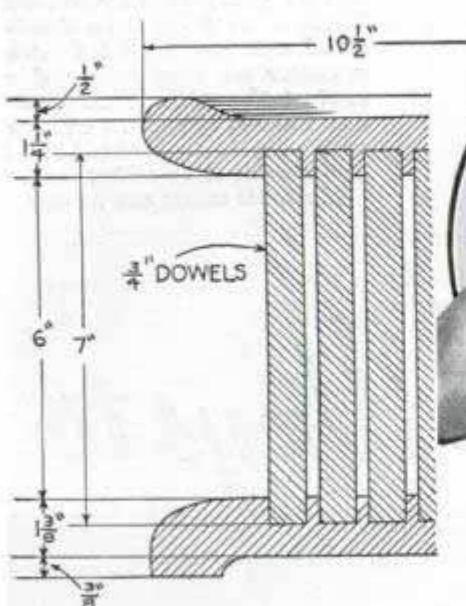
Handy for electricians or those whose work requires the handling of wire, this little cutter is made from two 3-in. lengths of an old hacksaw blade and can be carried in the pocket or on a key ring. Sharp edges of the blade should be ground smooth and the rivet should be drawn up snugly to get a good cutting action.

Drawing-Knife Shield of Wood

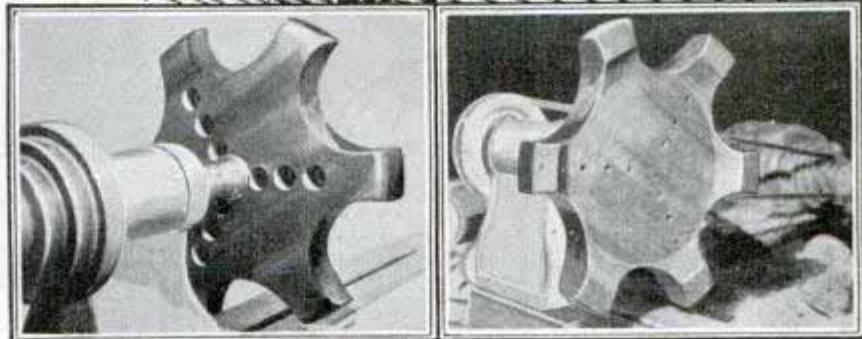
It takes only a few minutes to make this V-shaped trough of light plywood to protect the edge of your drawing knife when it is carried in a box with other tools. The knife is kept in the shield by a sliding top, which works in grooves cut in the sides.



Footstool Has Three-Way Column of Dowels



A turned and scalloped base and a "dished" or bowl-shaped top supported on a column made of dowels—that's all there is to it. You can make the base with scalloped edges as shown or a duplicate of the top so that the stool can be used either side up. With the index head on your lathe it's easy to lay out holes for the supporting dowels

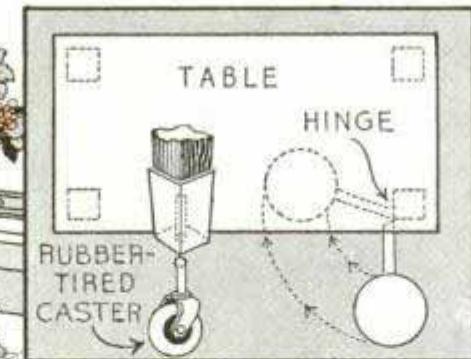


Large Aquarium Formed by Removing Top of Glass Jug

This aquarium is easily made by cutting off the top of a large glass jug and fitting a chromium-plated rim over the edge. Select a bottle with clear glass and fill it nearly to the shoulder with cold water. Wrap a strip of tape around the bottle with its lower edge opposite the water line. Carefully score the glass along the top edge of the tape with a glass cutter, or small three-cornered file. Then tie a string soaked in kerosene just above the score, tightly, and ignite it in three or four places, which will cause the glass to break along the scored line. The rough edge is smoothed with an emery stone or fine file. An attractive rim consists of copper tubing soldered to a brass or copper band, which is then chromium-plated. The edge of the band should be beveled where it joins the tubing, which should be bent to shape before attaching it.



Put washed sand in the bottom of the aquarium along with colored rocks and water plant



Stool swings under table

This simple, one-leg stool saves space in a crowded kitchen. A 2 by 2-in. hard-wood standard is fitted with a caster at one end and a seat at the other. Two hard-wood arms, hinged to one leg of the table, support the stool and permit it to swing under the table when not in use

Easy Ways to

To relieve the strain of gripping a heavy cleaver, which may tire your hands in a short time, with the risk of having it slip, fasten a strap or a strip of rubber to the lower edge of the handle as shown in the circular insert. Below, a simple wire holder to keep a spoon from falling into the kettle of hot preserves, or any other preparations that require frequent stirring

*Cleaver
won't
slip—*

*LARGE SAFETY-
PINS*



*HEAVY
WIRE*

*Repairing
seat springs*



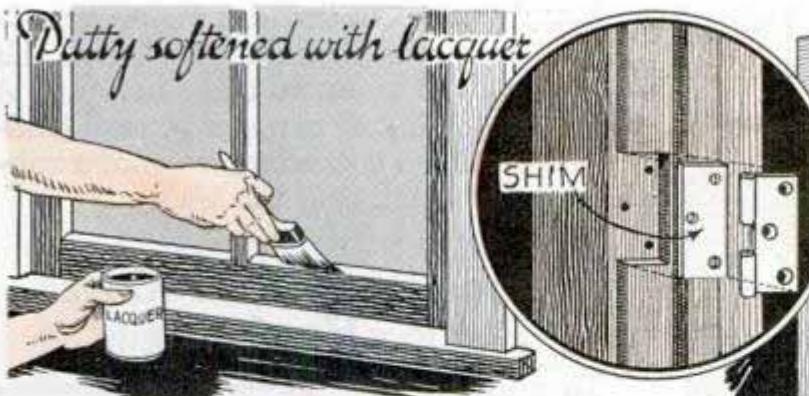
Spoon holder

Strong safety pins offer a means of quickly relocating springs that have slipped out of place in a car seat or a piece of upholstered furniture. The pins should be just long enough to reach from coil to coil when the latter have been located in their original positions. Right, two scrubbing brushes, one with stiff bristles and one with medium stiff ones, fastened to a washboard with brass screws, are always at hand to aid in removing stubborn spots from clothes. Just apply soap to the spot and then rub it briskly over the bristles of the brush most suited to the job



Brushes help remove spots

Putty softened with lacquer



Shrunken door fitted by shimming hinges



Solve Your

HOME PROBLEMS

Above, hardened putty is easy to remove from a windowpane if you first apply lacquer which will soften the putty in a short time. When a door lock fails to engage the striker plate due to lateral shrinkage of the door, the trouble is overcome by shimming up the hinges

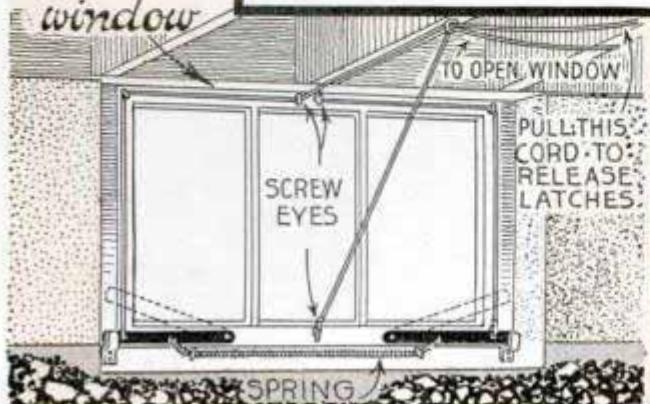
Cure for "howling" eave troughs



Linseed oil preserves sash cord

Remote control on coal-bin window

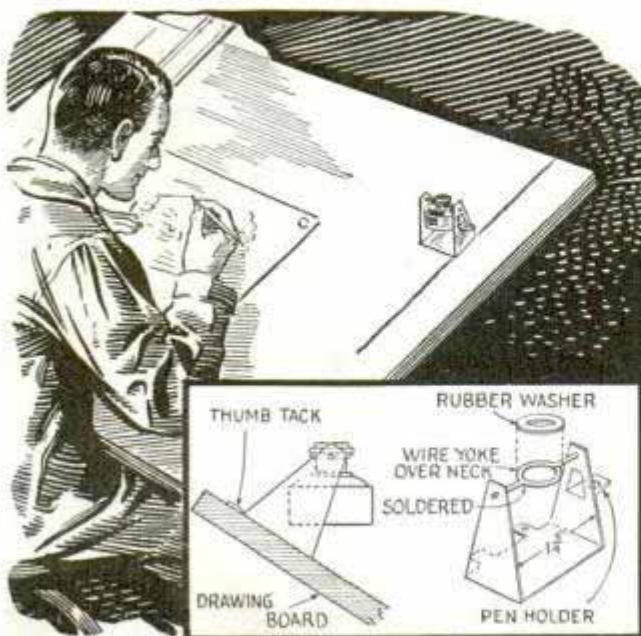
Strips of sheet metal, screwed to the edges of eave troughs at the corners and bent upward, will deflect wind, which vibrates them and causes howling noise. Below, a simple arrangement to open a coal-bin window from the door. The spring and pivoted latch arms are mounted on the sash, while the latch brackets or hooks are screwed to the window frame. Lower right, false fireplace that has become gloomy with age given a cheerful look by concealing the opening behind a cloth-backed grille



A fireplace panel



Holder Keeps Ink Bottle Upright on Tilted Drawing Board



Keeping the ink bottle upright, regardless of the tilt of your drawing board, this holder can be mounted close at hand. A wire yoke, swinging in a sheet-metal holder, supports the bottle by means of a rubber washer fitted over the neck.

Dome Glide on Screwdriver Reduces Hand Fatigue

To reduce the tendency of a screwdriver to tire and roughen the palm of his hand, one carpenter fastened a large dome furniture glide to the end of the handle.



Streamline Trailer Built With Hand Tools

You can tour with all the comforts of home in this 15-ft. family trailer containing a cookstove, sink, icebox, electric lights, closets, and sleeping accommodations for four. If interested, send \$1.00 for blueprints 937 to 942 giving complete details



Streamline Family Trailer—937 to 942

BOATS YOU CAN BUILD

"Roamer"—765 to 770: 16-ft. outboard cabin cruiser; two berths. Six prints \$1.00.

"Sea Saucer"—893: 9½-ft. sail boat. Deck, bottom and sides are 3/16-in. plywood. 25c.

17-Ft. Kayak—928 and 929: Light framework covered with canvas. Two prints 50c.

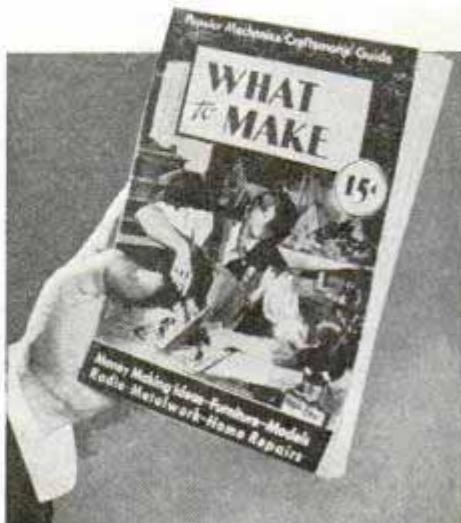
12-Ft. Utility Rowboat—707: Flat bottom. Four seats. Sturdy design. 25c.

16-Ft. Canoe—811 and 812: Cedar planking covered with canvas. Two prints 50c.

"Arrowhead" Sloop—944 to 951: Fast sailboat 21 ft. long, 5 ft. 11 in. beam. Set of 8 prints \$1.50.

1937 "WHAT TO MAKE"

This 96-page Craftsman's Guide is just crammed full of practical information and valuable reference data for workshop owners. It not only suggests hundreds of items that you can make, but also tells where to purchase hard-to-get supplies. Will be sent postpaid on receipt of 15c, in U. S. stamps or money order.

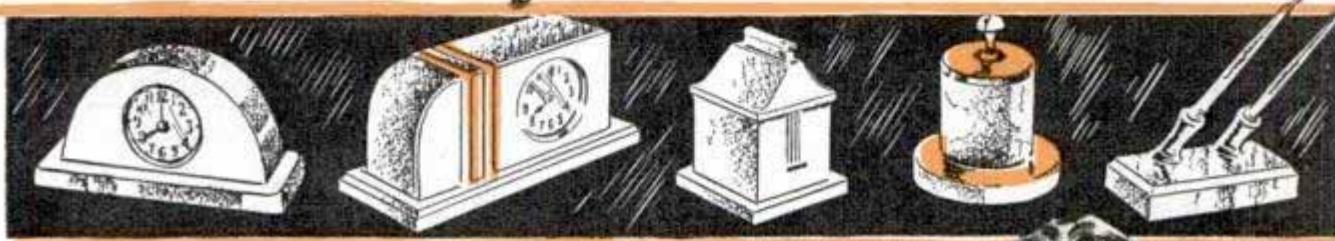


Address Blueprint Dept., Popular Mechanics Magazine, 200 East Ontario, Chicago



PLASTIC ORNAMENTS.

cast in flexible molds

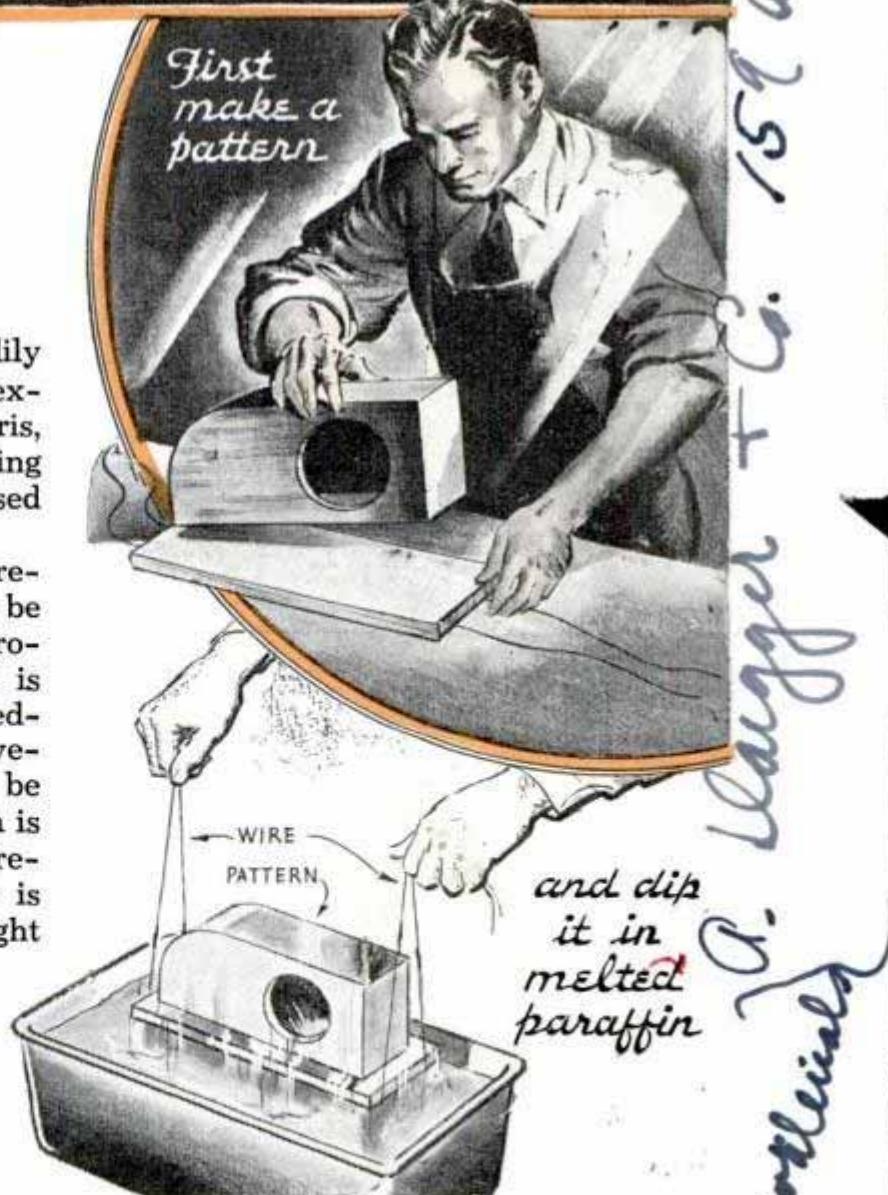


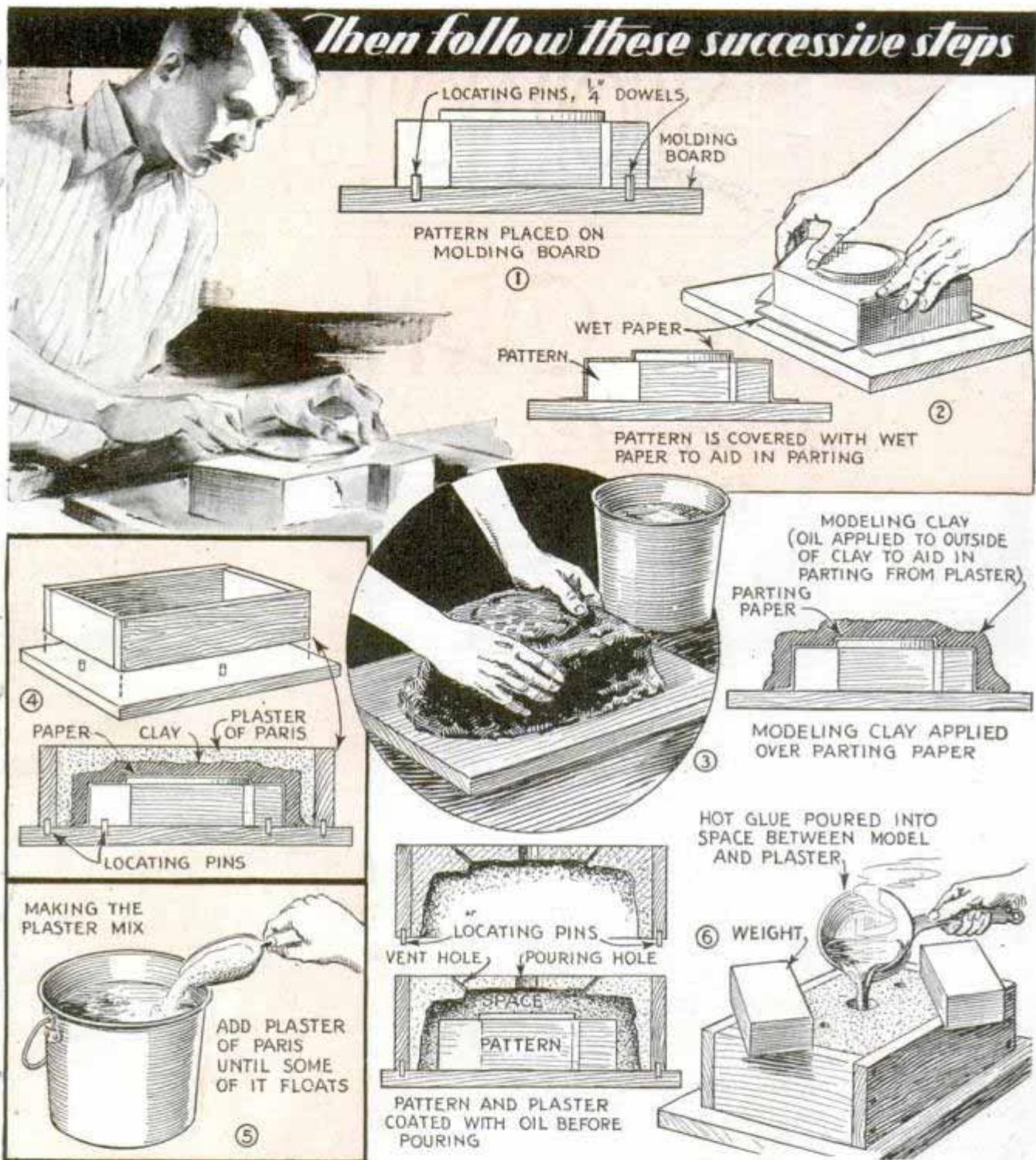
Hot glue poured over a paraffined wood pattern becomes a flexible mold for numerous castings

By C. A. CROWLEY

PLASTIC objects can be made readily by a simple casting process, using flexible glue molds. Besides plaster of paris, imitation marble compositions, including magnesite cement in colors, can be used as the plastic material.

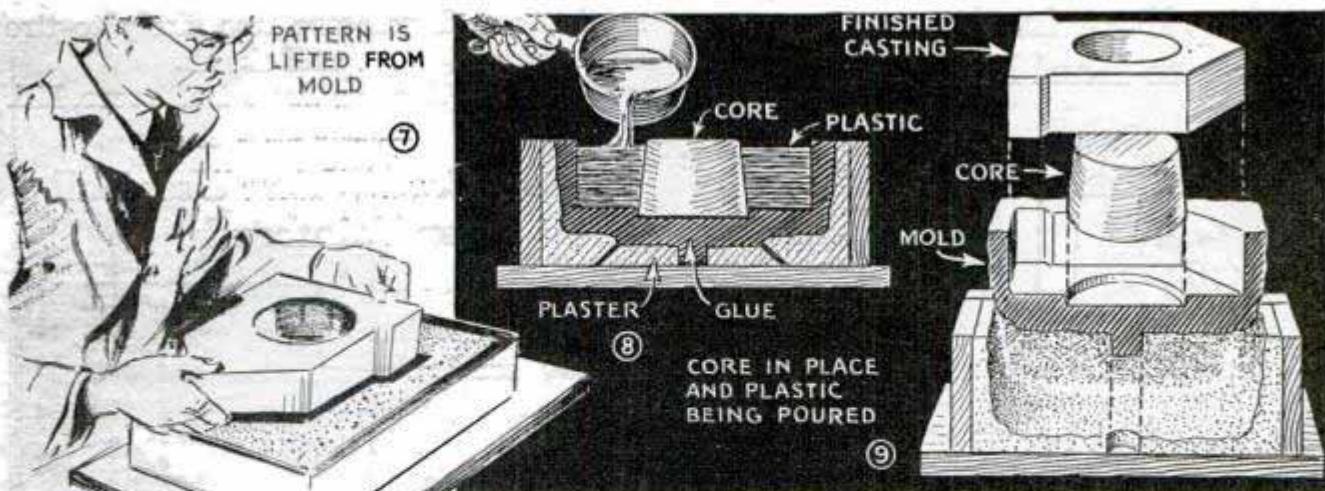
A pattern is first made of wood corresponding in dimensions to the object to be cast. To illustrate the process, the procedure for making a small clock case is shown in successive steps. The hollowed-out portion which is to receive the movement in the finished case should not be cut out. This is formed by a core which is an exact duplicate of the size opening required for the movement. The core is turned from hardwood and is given a slight taper to facilitate removal from the mold and finished casting. Patterns of both the case and core are immersed for 5 min. in melted paraffin to prevent adhesion of the various materials used in making the mold. Excess paraffin is wiped off immediately.





Now, beginning with the molding process, the pattern is placed on a board with locating dowel pins as in Fig. 1. Then in Fig. 2 the pattern is covered with two or three layers of newspaper soaked in soapy water. While the paper is moist, a layer of modeling clay is pressed over the pattern as in Fig. 3. Remember that the glue mold will be the same thickness as the clay coating. On a small clock case this should be about $\frac{1}{2}$ in. Finally, the clay is wiped with medium-heavy lubricating oil. Next a wood box is made, open at the top and bottom, and the inside measurements

about 1 in. larger each way than the pattern with the clay covering. Like the pattern, the box is pinned to the molding board, Fig. 4. Inside and bottom edges are coated with oil and a few small nails are driven through the sides and ends of the box near the top edges to project inside. Plaster of paris mixed in water as directed in Fig. 5 and stirred thoroughly, is scooped into the box, avoiding air bubbles. When the plaster is dry, vent and pouring holes are drilled as in Fig. 6. Then the box with the plaster is lifted off the pattern, the clay and newspaper are removed, and the



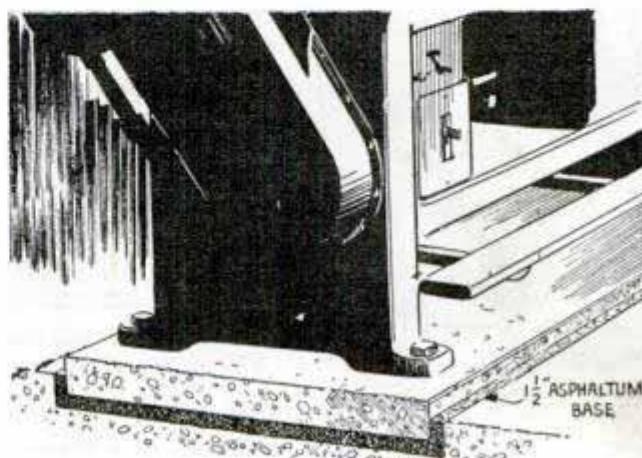
pattern is coated with oil. The box or "flask" is replaced and weighted, ready for pouring glue as in Fig. 6. To prepare the latter, flake glue is soaked 15 min. in cold water, then the excess water is poured off and the glue is melted in an improvised double boiler. After preparing, the glue should be poured into the mold in a warm room, the temperature not less than 72° F. Clay is used to stop glue leaks. The glue is allowed to harden in the mold for 12 to 15 hrs. after which the box is lifted from the molding board and the pattern is loosened by applying light pressure to the glue at the pouring hole, permitting the pattern to be lifted out as in Fig. 7. The oil is wiped from the glue mold and the latter is waterproofed by painting it with two coats of an alum solution or formaldehyde. It is then re-oiled, and the oiled wood core is set back in place, large end down. Now you're ready to pour the casting as in Figs. 8 and 9.

White magnesite molding compound is made by mixing dry the following ingredients: powdered calcined magnesite, 2½ lbs., white talc, 1 lb., fine sawdust or wood flour, 2 pts. To produce colors you can add burnt umber (brown), copper chromate (light green), copper carbonate (dark green), yellow ocher (yellow), cobalt oxide (blue), and carbon black (black or grey). Then a wetting solution is prepared. This consists of magnesium chloride solution (25° Be.) 10 pts., and magnesium sulphate solution (15° Be.) 1 pt. The mixed solution is strained through a piece of cheesecloth and enough of it is added to the dry powders to produce a consistency equivalent to ordinary pancake batter. Then the mix is poured into the mold immediately. After the finished

castings have been removed from mold and allowed to "age" for 36 hrs., the "bloom" may be removed by washing in tepid water and wiping the surface dry with a piece of soft cloth. To produce a final finish, the surface is rubbed thoroughly with moistened pumice stone, wiped dry and painted with boiled linseed oil. Molding can be done also with cement. A dry mix is made from Portland cement, 1 pt., and fine sand, 2½ pts. After thoroughly mixed, enough water is added to produce a mixture of about the consistency of cream. Portland cement requires about 12 hrs. for complete hardening.

Shop-Machine Bases Insulated Against Vibration

You'll find asphaltum a good substitute for cork and other expensive materials when cushioning the concrete base of heavy shop machines against transmitting vibration to the floor. First pour melted asphaltum to a depth of 1½ in., allow it to cool and then pour the concrete. When the forms are removed, the asphaltum can be poured around the sides of the base.



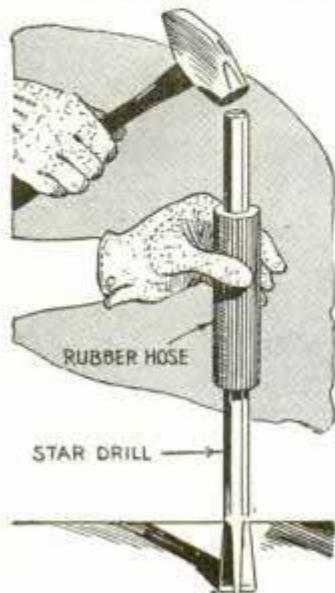
Trap Door in Wheelbarrow to Haul Milk Can



Milk can rests in hole of wheelbarrow floor to lower center of gravity of the load

After upsetting a can of cream, which was being hauled to a cooling cellar in a wheelbarrow, one farmer cut a trap door in the floor of the wheelbarrow so that the can could be set in it to lower the center of gravity of the load. The cut-out section of the floor was hinged so that it could be dropped back in place, and a steel bracket was suspended beneath the wheelbarrow to hold the can.

Rubber Hose on Star-Drill Shank Gives Shock-Absorbing Grip



Slipped over the shank of a star drill, a short length of corrugated rubber hose provides a grip that not only tends to absorb shocks to the hand from the hammer blows, but one that assists the fingers in turning the drill. Also, the rubber affords a larger grip on small drills.

so that the fingers are less likely to tire from gripping the small shank.

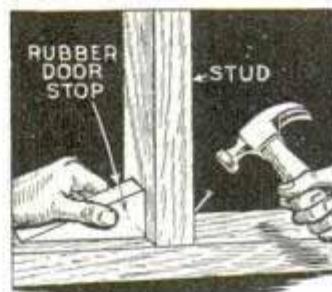
—Thomas Trail, Baltimore, Md.

Show-Card Writer Uses Ball on Paintbrush

A show-card writer claims that a small, solid rubber ball slipped over the handle of his brush as shown, enables him to work for long periods without undue hand strain from gripping the brush handle as the ball provides a large surface for the hand to grip. It's an easy matter to punch a hole through the center of the ball so it can be slipped on and off.



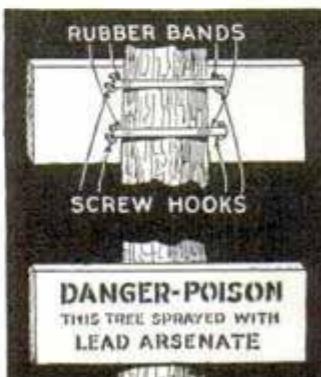
Studs Held Against Doorstop When Toenailing



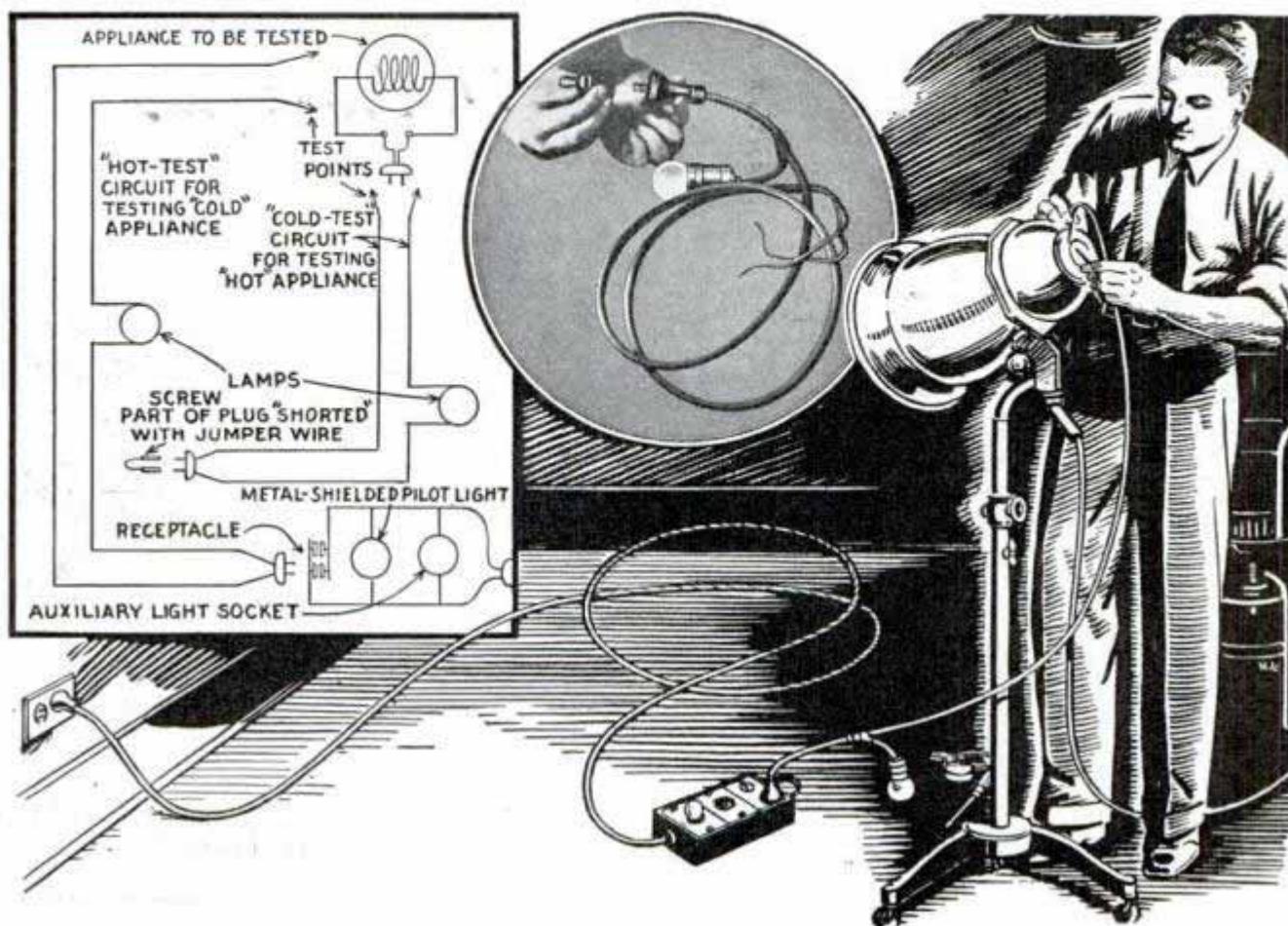
One carpenter carries a rubber doorstop in his tool chest for use in holding a stud while toenailing it to the floor or joist. The blunt end of the stop is held against the lower end of the stud and with the hand while the nails are driven into the other side. Friction of the rubber against the joist or subfloor is sufficient to hold the stud, and the rubber also absorbs much of the shock of nailing.

Tree Signs Have Elastic Holders to Protect the Bark

When temporary signs are put up around parks, farms and estates, it's a good idea to attach them with rubber bands to avoid damaging trees and permit quick attachment or removal.



Junction Box for Electrical Trouble Shooting

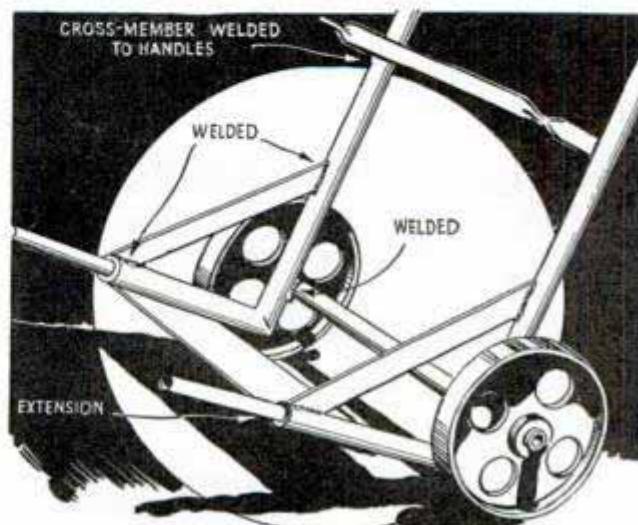


Frequently called out to check electrical equipment installed in beauty shops and similar places, I make use of the junction box and test cord shown. The box has an extension cord to bring the current supply to the spot where needed, and as it is fitted with a pilot lamp, there is no uncertainty concerning the current supply, which is often the source of trouble. Besides a pilot light, a lamp socket and a duplex wall receptacle are wired together in the box. The socket is used in case the pilot lamp burns out, while the cords to the appliances may be plugged into the receptacle. The test cord is a simple series hookup of a plug, light socket and two test points for checking disconnected appliances. The cord is quickly adapted for testing connected appliances by short-circuiting the screw part of a plug and slipping it over the prongs of the plug on the test cord.—P. Fairmont, Cleveland, O.

Negatives so dense that they are impossible to print in the regular way may often be used if a photoflood bulb is put in the printer instead of the ordinary bulb.

Hand Truck Extension Pieces Provide Adjustable "Scoop"

In this truck, tubular steel handles are welded directly to the axle and are bent at right angles at the lower end to accommodate extension rods, which are adjusted to suit boxes of varying widths. For rigidity, a wide piece of flat iron is welded across the bent ends and flat-iron cross members are welded on as indicated.



Chemical Co. staggered is

¹⁵⁹ W. Kinzie Chicago
Mallinckrodt Chemical Works

Malvernrod Chemical Works

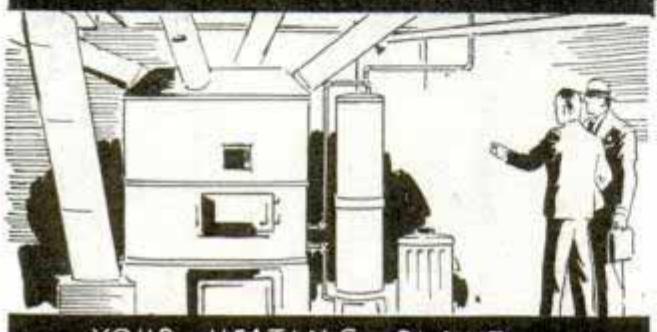
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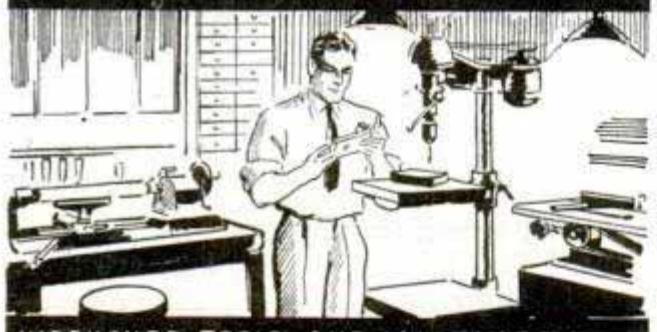
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How to protect:

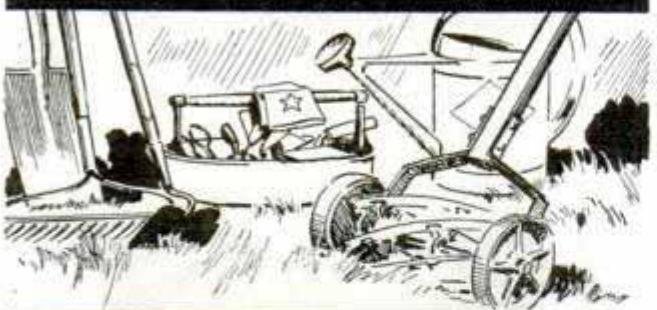
YOUR AUTOMOBILE . . .



YOUR HEATING PLANT



WORKSHOP TOOLS AND MACHINERY



GARDEN TOOLS . . .



GUTTERS AND DOWNSPOUTS . . .

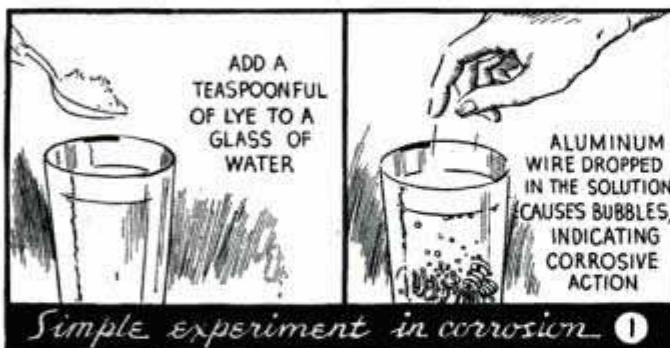
Corrosion is everybody's problem. Needless waste of millions annually can be reduced by preventive and inhibitive measures

By C. A. CROWLEY

AUTOMOBILES, shop and farm machinery, metal building equipment—all are subject to gradual destruction by corrosion. In industrial cities this action is greatly accelerated because of the acidic fumes in smoke, and along the sea coast the presence of salt in moisture-laden air hastens the process. While there is no "cure-all" for corrosion, it can be minimized and to do this you must first determine the exact cause, which varies.

Electrolytic corrosion is illustrated in Fig. 3, where a sheet of copper and a sheet of zinc are immersed in an acid solution. When the two are connected together by a wire, an electric current flows from the copper to the zinc and at the same time the zinc is gradually dissolved or corroded away. A particle of carbon or metal dust on the surface of steel or other metal may act in exactly the same way where moisture saturated with gases takes the place of the acid in the cell. Another type of corrosion is termed the "concentration-cell" effect and is illustrated in Fig. 4. Rusting through of hot-water pipes at the fittings is caused by a small amount of iron dissolving in water trapped between the threads, forming a solution which contains more iron than does the water flowing through the pipe. Even though the solutions are in contact with the same metal, a slight electric current will be generated and the iron will corrode. The most destructive type of corrosion is caused by the presence of both moisture and oxygen. Neither pure, air-free water nor oxygen alone corrodes dry iron or steel, but these

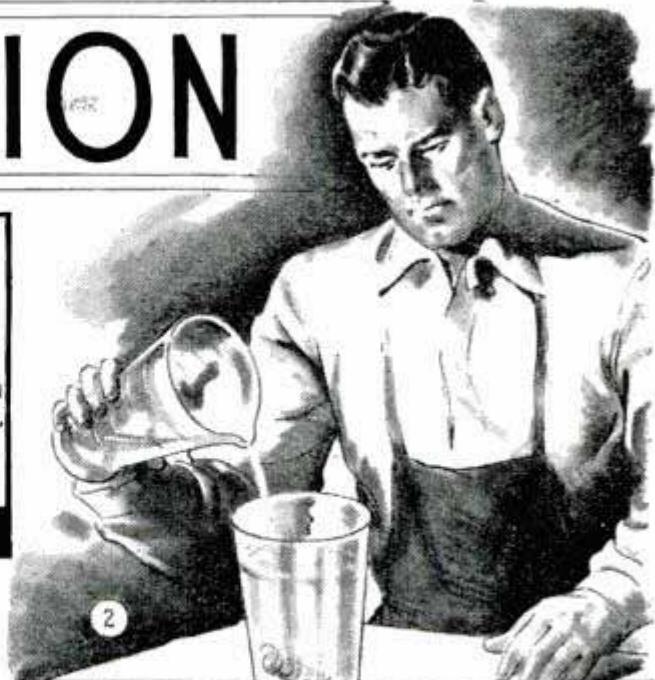
CORROSION



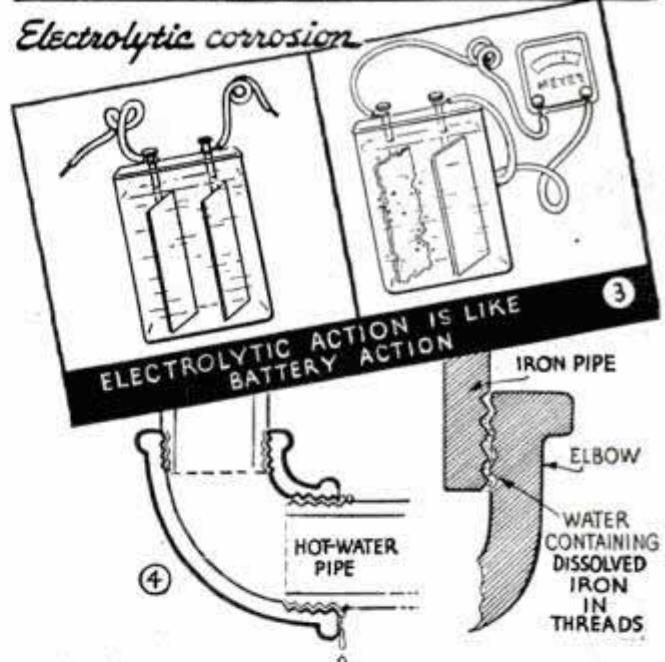
two harmless components are usually together.

Copper, iron, and aluminum are often observed not to corrode after a non-porous oxide film has been formed on their surface. However, these films are destroyed by acid, where smoky conditions prevail. Mechanical strain in metal also assists in setting up electrolytic action as the strained area and an unstrained area of the same piece act like two different metals. Highly polished surfaces offer increased resistance to corrosion because moisture does not condense upon them so readily and there is less surface on which corrosion may start.

Among the most effective inhibitors of corrosion are potassium chromate and sodium chromate. Their striking action may be demonstrated by a simple experiment, Figs. 1 and 2. Bubbles of hydrogen caused by the action of the lye solution will cease when a few drops of sodium-chromate solution are stirred in. Chromate inhibitors are useful where oxygen is present as in aerated liquids, but are ineffective in closed systems which are oxygen free. Enough of the chromate must be present in a neutral or alkaline solution, and the surface to be protected must be clean. Some hard waters containing magnesium chloride or calcium chloride become acidic after heating. Chromates are not effective in these cases, but such waters may be made less corrosive by adding lye or sodium carbonate until they color phenolphthalein pink as demonstrated at the right of Fig. 5. To determine the resistance of various metals to the corrosive ac-

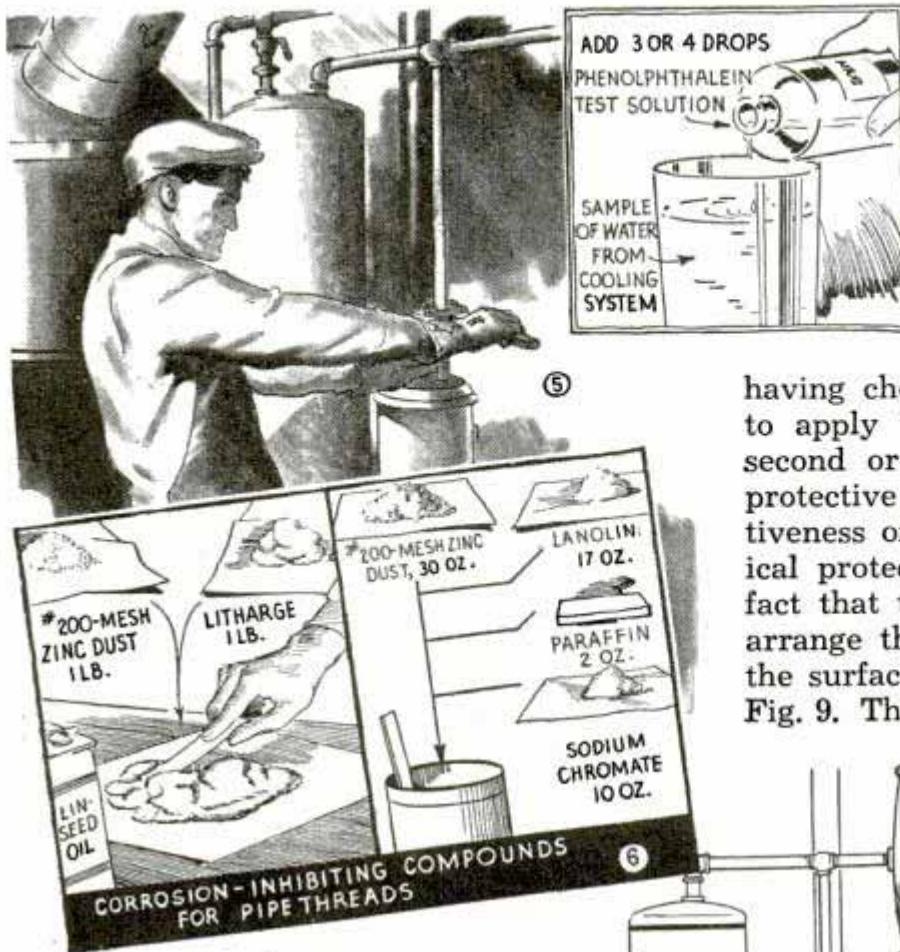


THEN ADD A SODIUM-CHROMATE SOLUTION — THE CORROSION ACTION CEASES



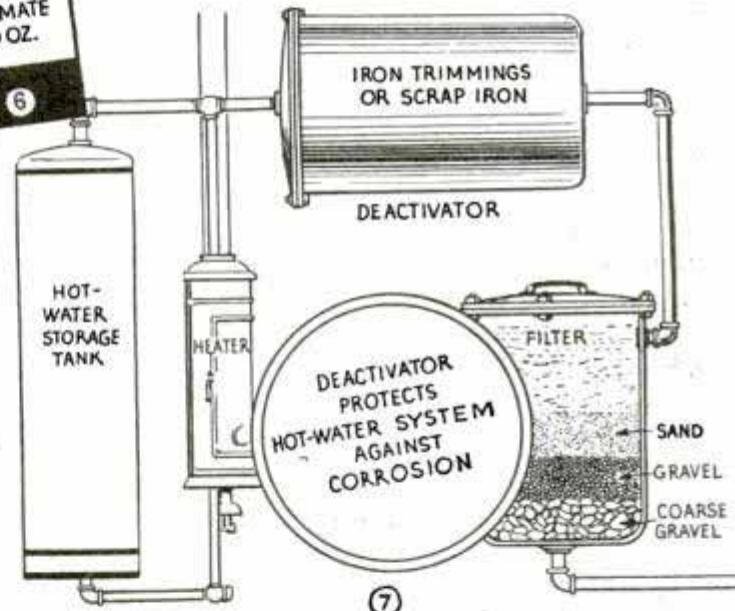
tion of water, samples of similar size and shape of the metals to be tested are placed under funnels in the water as in Fig. 10, and test tubes of water inverted over the openings of the funnels. After standing overnight, the volume of gas collected in each tube is measured and the appearance of the samples compared. Much gas collected in a tube indicates poor resistance.

Application of proper paint is probably the best protection for metal surfaces against corrosion. Paint should be used before corrosion has begun. After corrosion has started, all of it must be removed



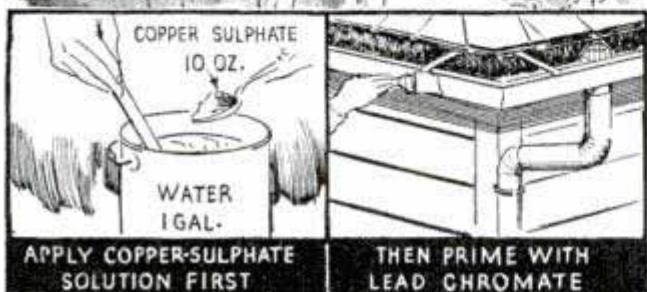
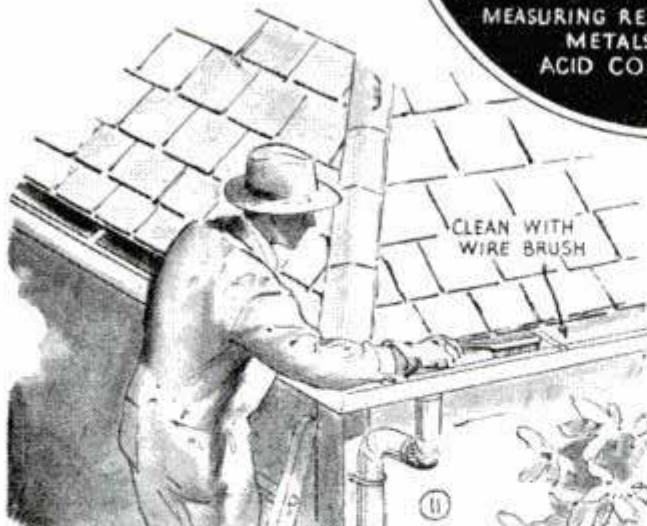
and the metal must be thoroughly dry before painting, as the corrosion will eventually loosen and the paint will come off with it. Then, a good corrosion-inhibiting priming coat of paint should be applied and this followed with a waterproof paint coat. The best inhibiting pigment in the priming coat for structural metals has been found to be basic lead chromate (American vermillion). Red lead is also good. To be effective as a corrosion-inhibiting coat, the pigment must be ground very fine. Iron-oxide paints offer physical protection only. They produce excellent films. Blue lead (basic lead sulphate) is also a good pigment for priming coats because, in addition to physical protection, it has a chemical action which inhibits corrosion. Zinc oxide and metallic zinc, when incorporated in paints, have been found to give excellent results. Metallic zinc in a paint offers somewhat the same protection as does galvanizing on iron, as it is destroyed by the electrolytic effect instead of the iron surface to which it is applied. Carbon pigments such as lamp black, graphite, oil black, etc., should not be used in the priming coat as they

start electrolytic corrosion. They are satisfactory ingredients for finishing coats, however. Though aluminum paints have been used as priming coats on metal because of their excellent physical protection, it is better to use a primer having chemical inhibiting action and to apply the aluminum paint in the second or third coat for its physical protective value. The unusual effectiveness of aluminum paints as physical protective coatings is due to the fact that the tiny flakes of aluminum arrange themselves like fish scales on the surface being painted as shown in Fig. 9. These flakes, being opaque, pre-

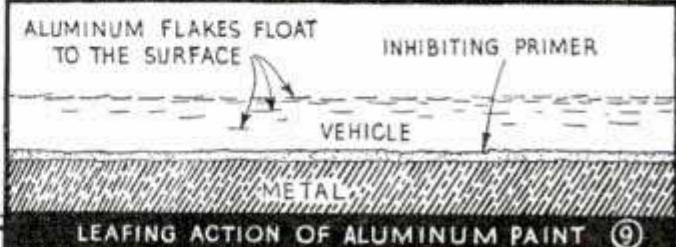


vent the entrance of ultraviolet light, which is one of the greatest factors in destroying paint films. Aluminum is particularly effective as a physical protection against corrosion when incorporated in one of the modern synthetic resin base paints. To avoid difficulty in making paint stick to galvanized iron surfaces, allow the metal to weather for at least six months before painting. Then it must be cleaned carefully as in Fig. 11, and brushed with a solution made by dissolving copper sulphate, 10 oz., in water, 1 gal. This roughens the surface and causes a thin coating of copper to plate on the surface. After the surface is thoroughly dry, it may be painted with an inhibiting priming coat of paint followed by any desired finish coat.

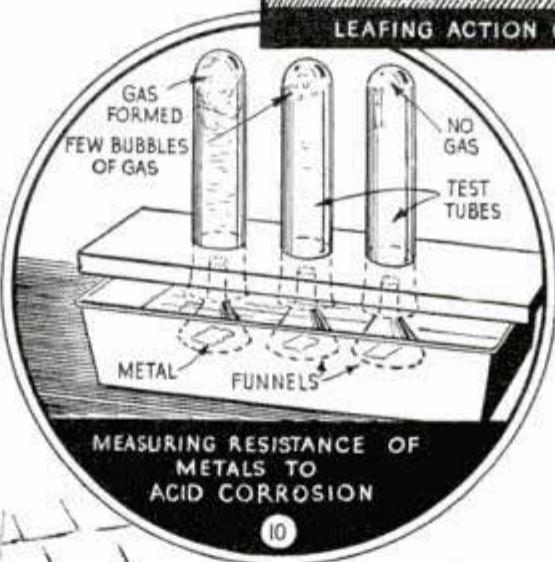
Draining water from heating systems during summer months and refilling with fresh water causes excessive corrosion in the system, as safe oxygen-free water is being replaced by that containing oxygen. "Stale," rusty water is not injurious and it should not be drained except when making repairs or alterations. If a



ALUMINUM PAINT GIVES BEST PHYSICAL PROTECTION TO METALS EXPOSED TO THE WEATHER.



LEAFING ACTION OF ALUMINUM PAINT ⑨



proper type of thread compound is used during installation, or when repairs are made, there will be little trouble from pipes rusting through at the joints. A corrosion-inhibiting thread compound is made by mixing 200-mesh zinc dust, 1 lb., with ordinary linseed litharge thread compound, 1 lb. See Fig. 6. When thoroughly mixed, linseed oil is worked in to reduce the batch to its original consistency. This compound produces a gas-tight joint, even in vacuum systems. A still more effective compound for this purpose is made by warming together lanolin, 17 oz., paraffin, 2 oz., powdered sodium chromate, 10 oz., and zinc dust (200 mesh), 30 oz., at a temperature of 105° F. and thoroughly mixing. If desired, this mixture may be thinned with naphtha.

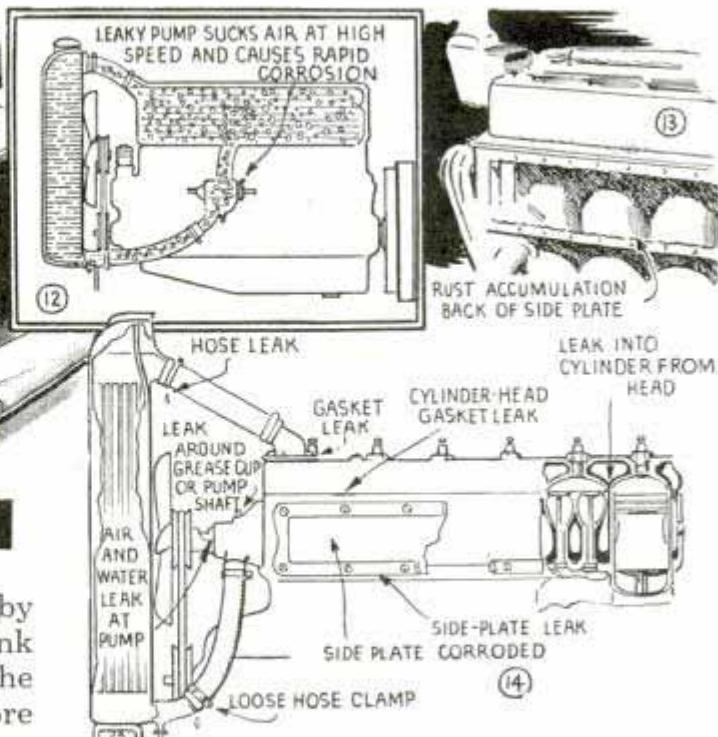
If the water in a heating system contains acid-reacting materials like magnesium or calcium chloride, it should be made alkaline by adding lye or sodium carbonate to give just a pink color with a phenolphthalein test solution as in Fig. 5. Deactivating a hot-water system to pro-



TECT it against corrosion is possible by providing an extra hot-water storage tank filled with scrap iron, as in Fig. 7. The hot water is filtered in this tank before going to the distributing system. If a continual stream of water passes over the valve seat of a leaky faucet, corrosion takes place and roughens the metal. Therefore, a new packing should be installed immediately.

Garden tools, farm implements and shop tools require a corrosion-preventive coating that can be removed, yet not too easily rubbed off. A non-drying compound for this purpose consists of lubricating grease, 1 lb., mixed with sodium chromate, 60 grains, as in Fig. 8. The grease is placed in a pail and heated in a pan of boiling water until soft. The finely powdered sodium chromate is stirred in carefully and completely. The mixture may be thinned with petroleum naphtha for brushing or spraying. Or, it can be applied with a rag. Polished steel surfaces should be cleaned with a hot soap solution and may be dipped in the mixture.

The cooling system of an automobile is most susceptible to corrosion as it consists of several kinds of metals, which promote electrolytic corrosion. Rock salt, calcium chloride and other salts should never be used to prevent freezing because they accelerate corrosion. Alcohol, glycerin, or ethylene glycol, on the other hand, are all effectual and help to reduce corrosion. As auto cooling systems contain considerable air, sodium chromate, 1 oz., should be added to the water. If the water contains calcium chloride or other impurities, it should be made neutral or very slightly



alkaline with soda ash. Greases must not be added as they cause "frothing." One of the worst conditions responsible for corrosion in an auto motor is a leaky water pump or a leak in any part of the cooling system. The rubber hose at the base of the radiator is a frequent offender. When the motor is running, air is drawn in through these leaks and mixed with the water as in Fig. 12, thus saturating it with oxygen. The rate of corrosion has been shown to be increased as much as nine times under these conditions. Another source of corrosion in the motor is a leaky head gasket, Fig. 14, which is sufficient to allow gases from the explosion chamber to be absorbed by the water. Acid fumes in the gas greatly increase corrosion. Modern cars with aluminum cylinder heads are more subject to this trouble than the older types as the rate of expansion of aluminum with changes in temperature is not the same as that of iron. To prevent this, keep the head bolts drawn up tightly.

Where highways are sprayed with a solution containing calcium chloride to lay the dust, fenders and chassis of automobiles will be damaged. Where paint comes off, the exposed parts should be repainted immediately after all trace of rust has been removed by steel brushing and washing with benzine. When bright metal shows, the surface should be painted with a basic lead chromate primer, followed, when dry, by paint having good physical

protective properties such as aluminum paint. If the bright color is objectionable, it may be covered with black paint. The chassis and springs can be protected against corrosion by spraying or brushing with a preparation made by mixing lubricating grease, 1 lb., sodium chromate (powdered), $\frac{1}{2}$ oz., motor oil (S.A.E. 10), 2 qts., and water, 1 oz. The grease is placed in a pail and heated in a larger pan of boiling water. When soft, the finely powdered sodium chromate and water are stirred in until the consistency is smooth. Then the motor oil is added and stirring continued until the mixture is cool.

Carbon tetrachloride is sometimes used for flushing the crankcase. While it does remove sludge which adheres to motor parts, carbon tetrachloride, used even for a brief period, is very corrosive. When the motor warms up, it reacts with moisture in the crankcase, to form phosgene, a toxic gas, and hydrochloric (muriatic) acid which quickly attacks the metal parts of the motor, especially the bearings used in modern cars. The addition of organic chemical compounds containing chlorine to crankcase oils in automobiles to improve lubrication is subject to the same criticism as the use of carbon tetrachloride; when the engine becomes hot, these compounds react with the moisture and produce hydrochloric acid. However, there are available oil-addition products, free from chlorine, which do improve the lubricating characteristics of oils, and some of them have marked corrosion-inhibiting properties in addition. Anyone may readily test an oil or oil-addition product for chlorine by taking a piece of clean copper wire and holding it in the upper portion of a colorless gas flame until it no longer imparts a green color to the flame. While still red hot, quickly dip the heated portion into the oil sample to be tested. Again hold the wire in the upper portion of the flame. First the oil will burn off with a yellow flame. If chlorine is present the flame will turn green.

On some new machines used to churn mayonnaise, one company covered the high-speed shafts of the machines with a welded-on layer of cobalt-base alloy to prevent wear and the chemical attack of vinegar seeping through the packing.

Movable Form Aids Contractor in Filling Between Joists



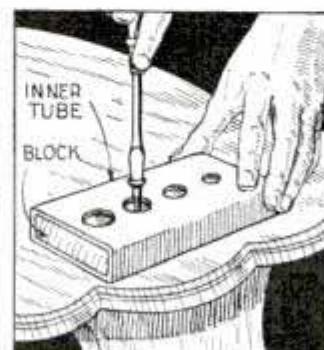
"Walling out" over foundation between the floor joists with concrete of stiff consistency

Contractors who fill in between floor joists with concrete will find this movable form helpful. If care is taken so that the concrete mixture is not too wet, and sufficient tamping is done, the form can be removed immediately after pouring the concrete and can be used again as many times as needed.

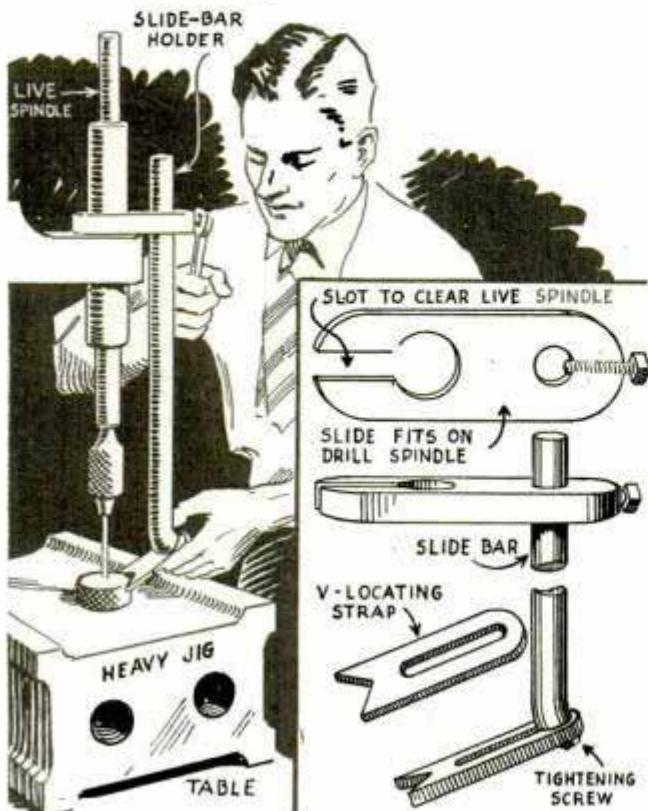
—Franz Serdahely, Wauwatosa, Wis.

Furniture Protected by Block When Assembling

To prevent accidental marring of furniture by having a screwdriver slip when assembling it, one dealer has his workmen use rubber-covered blocks of the type shown. Holes of varying sizes are drilled through the block and rubber covering. Should a screwdriver slip when driving a screw, the point will strike the rubber covering of the block.



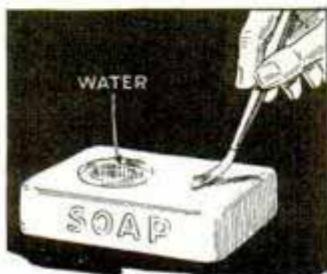
Heavy Drill-Press Jigs Centered by Simple Attachment



This attachment locates drillpress jigs accurately to avoid breaking small drills

Difficulty often experienced in accurately centering heavy jigs on a multiple drill press is avoided with this simple attachment, construction of which is given in the detail. It consists of a slide-bar holder bored to fit the spindle and slotted to pass over the smaller diameter live spindle. It carries the slide bar which is slightly bent at the other end to take the V-strap, the reason for the angle being so that the strap will clear any obstructions around the bushing. The attachment can be adjusted to suit a jig bushing head of any size. In use, once the attachment is set, the bushing head is brought up against the V-locating strap to center the drill.

Artists' Brushes Kept in Shape with Aid of Soap Cake

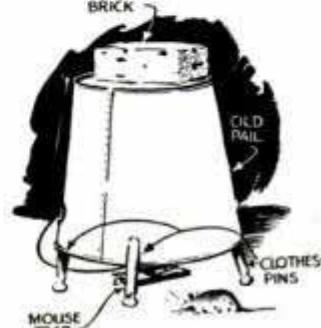


Artists will find that by rubbing their wet brushes over a cake of soap before laying them away, the bristles will keep their shape. A depres-

sion large enough to hold a few spoonfuls of water should be gouged out of the cake near one end. Then, after washing a brush, wet it in the soapy water of the depression, and shape the bristles on the smooth surface of the cake. The brush need not be washed out the next time if it is used in water-soluble colors. In fact, the soap often assures a letter of clean outline when the work may be soiled by perspiration from one's hands.

Catching Mice in Poultry House

In order to set mousetraps in his poultry house without endangering the fowls, one poultryman turned a bucket over the trap as shown. Four clothespins slipped over the rim served as legs to raise the bucket above the floor so mice could enter, and a brick placed on top weighted it so that the fowls would not upset it.



Paper Stock on Press Feed Board Held Between Pegs

If rubber-covered wooden pegs are set in holes drilled in the feed board of a job

press to hold the paper stock, there will be less risk of having the sheets blown about in case a window is open. A row of holes should be provided so that the pegs can be located to accommodate various sizes of stock commonly used. Lengths of rubber tubing are slipped over the pegs so that the uncovered ends fit the holes. It is best to have the pegs spaced so that there will be a slight friction against the stack of paper.

¶A tiny pinch of salt placed around the wick of a candle will cause it to burn longer and produce a steady flame.

A. Haagger & Co. 189 W. Kinzie
Chicago (all materials)

LUMINOUS PAINT

is easy to make



Novel and practical uses
for this paint make it
a profitable sales item

YOU can make luminous paint in any quantity—even enough for covering the walls and ceiling of a den or workshop is no more expensive than good wall paint. At night the room will glow with a soft, mysterious light. Small quantities can be made with very simple equipment, a clay pipe and bunsen burner as shown in Fig. 1, being the only equipment needed.

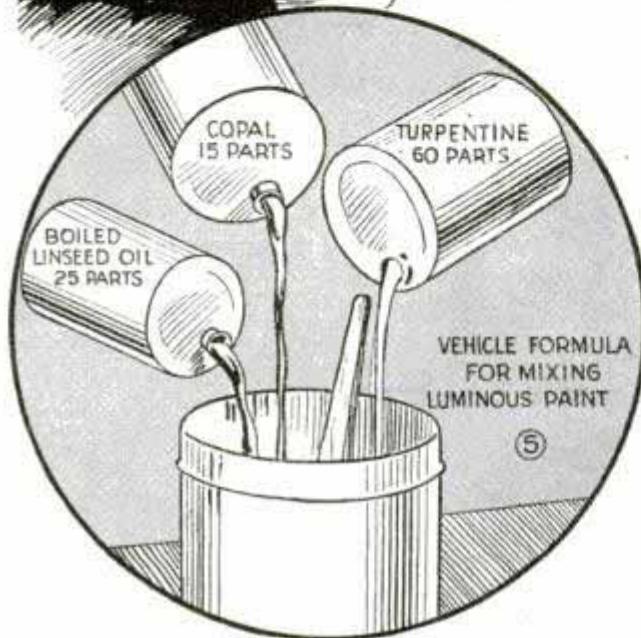
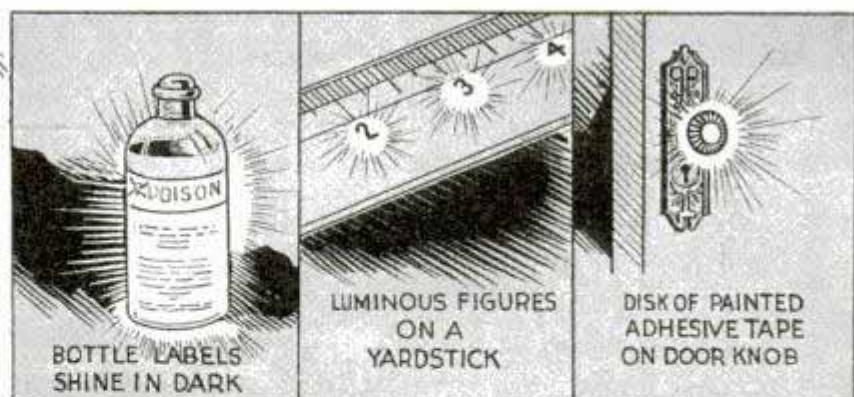
The chemical ingredients must be ground thoroughly as in Fig. 3, then mixed by repeated sifting, Fig. 4. The formula given in Fig. 2 is sufficient for making up a number of 2-oz. batches. Use only the chemically pure grade of calcium oxide. Should there be a trace of iron present, it will cause unsatisfactory results. To mix the bismuth nitrate with the other chemicals, dissolve in water, 5 grains, and then use only one-fifth of the solution. After the compound has dried, pack as much of

The Formula

CALCIUM OXIDE, 10 OZ.
SULPHUR, 3 OZ.
STARCH, 1 OZ.
BISMUTH NITRATE, 1 GRAIN
SODIUM CHLORIDE, 33 GRAINS
POTASSIUM CHLORIDE 33 GRAINS
MORTAR



REPEATED SIFTING TO
MIX CHEMICALS



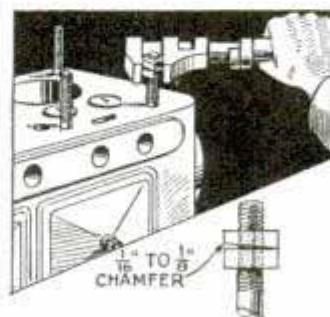
it as possible into the clay pipe and then cover with several layers of asbestos moistened with water glass to insulate against loss of heat in the upper part of the bowl. Then bring the bowl to a low, red heat over the bunsen burner and hold at this temperature for 15 min. At the end of this time, raise the flame to bring the bowl to a bright red or white heat for an additional 15 min. Then allow the pipe to cool slowly. After this treatment the chemicals will have changed their form and must be re-ground to a fine powder and sifted as before.

To make an easy-brushing paint, the luminous powder can be mixed with either a water or spirit varnish. Gum arabic dissolved in water to the consistency of varnish makes a suitable vehicle where the paint is to be applied indoors. A more flexible and durable vehicle is a spirit copal varnish, which can be bought ready prepared or mixed as in Fig. 5.

You'll find many uses for the paint. For example, brush it on the back of adhesive tape and then cut the tape in small squares

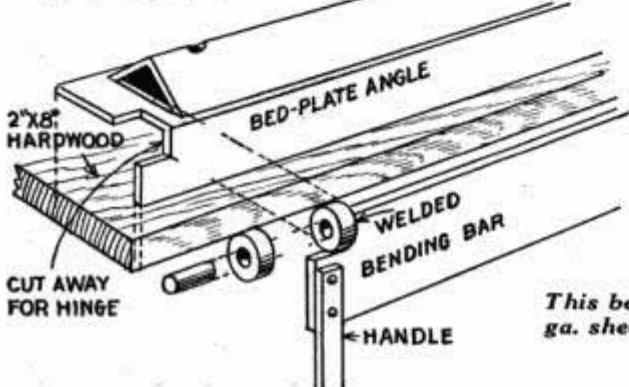
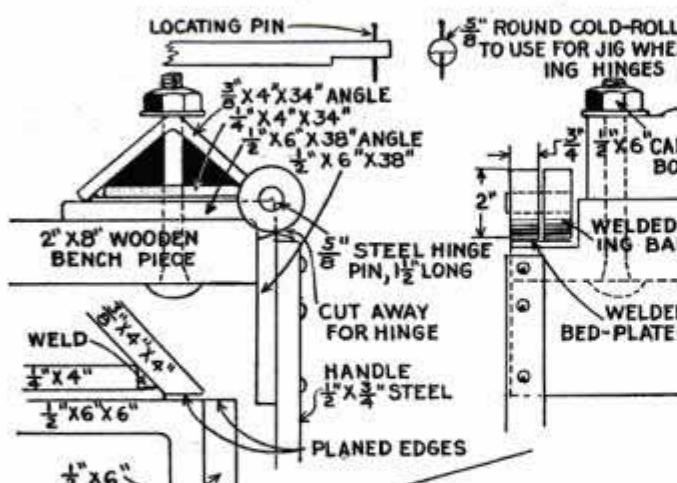
or disks. It will stick practically anywhere. Pull-chain pendants can be made by painting the inside of a short piece of glass tubing, allowing it to dry, then plugging the ends and adding a screw eye. For novelty effects, amateur theatricals and the like, you can make gowns and other garments of cheesecloth and coat them with the luminous paint. Remember that if garments or masks have been packed away for some time, they must be hung up before using so that the paint can "drink in" light. To make the luminescent quality serve more practical purposes, paint it on corks or labels of bottles containing poison. Clock hands and numerals also can be given an application with a small camel's-hair brush. By coating the inside of the lid of a fishing-tackle box you can always find just the plug, spinner, or leader you want, even though it is quite dark. Sometimes it's handy to have the numerals on a yardstick, rule or flexible tape show in dark corners. If you use this paint on walls, reduce the solution to an easy brushing consistency so that you can be sure of a uniform application. It should be remembered also that luminous paint gradually loses its effectiveness.

Effective Lock Nut Easily Made



A lock nut that will hold tightly can be made by chamfering the face of a regular nut. When this is screwed tightly against another plain nut, it tends to force the chamfered side down, which binds the threads firmly against the bolt.

Handy Bending Brake for Use in Small Shops



This bending brake will make clean, sharp bends in No. 16-ga. sheet metal, and will take a sheet up to 30 in. in width. It's made from steel bar and angle stock

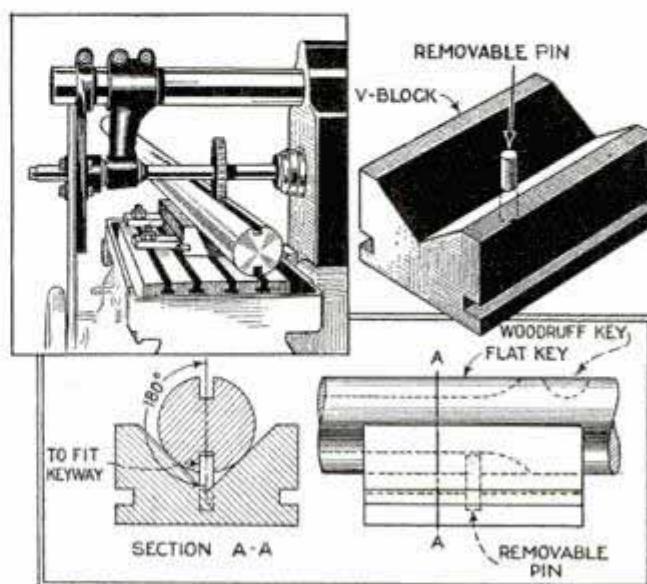
Built of steel angle and bar stock, this bending brake will handle No. 16-ga. iron up to 30 in. wide. Some machine work and welding are necessary. First, a stiffening bar is welded inside the angle hold-down as indicated in the end views. The second job consists of welding the two parts of the hinge in place, one to the bending bar, the other to the notched end

of the bed-plate angle. Then the forward edge of the hold-down is planed true and one face and edge of the bending bar are milled flat. The hinge consists of two disks cut from cold-rolled shafting, each center-drilled for a $1\frac{1}{8}$ -in. hinge pin. These are held in place for welding by means of a jig as in the top detail.

—G. F. Lampkin, Bradenton, Fla.

Keyways Milled in Shaft by Using Guide Pin and V-Block

If you have occasion to cut two keyways 180° apart on the same shaft, the job can be done easily by using a removable steel pin inserted into a hole drilled in the bottom of a V-block as shown. In use, one keyway is cut in the usual way. Then the work is removed and the pin, which must have a diameter equal to the width of the keyway, is put in the block after which the shaft is again placed in the block with the pin projecting into the keyway. The pin then serves as a guide to hold the shaft accurately for cutting the second keyway. Pins for various keyways can be had by making the projecting ends different diameters.—Ed. J. Hartel, Jamaica Plain, Mass.



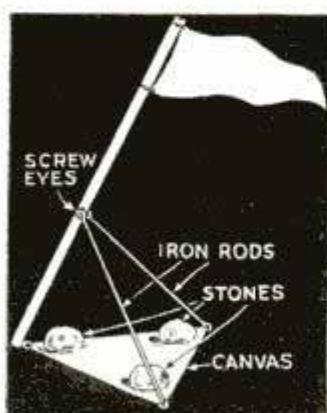
Triangular Rule Has Rubber Grip Which Serves as Marker



Rubber handle is quickly moved to the edge of the ruler carrying the scale being used

A $\frac{1}{2}$ -in. rubber hose, slit lengthwise, and slipped over one edge of a triangular scale, provides a good handle and serves as a marker for the various scales. As most rulers of this type are provided with several scales, the marker when slipped over the edge of the ruler above the scale being used, serves as a guide in placing the right one on the work.

Warning Flag Has Canvas Apron to Weight It Down



stored in a small space. Such flags offer no dangerous obstacle to traffic when

Fitted with this apron and a couple of iron-rod legs, a warning flag can be set up anywhere and weighted with a few stones to hold it in place. When not in use, the legs are folded against the staff so that the flag can be

they are placed along a street or road, as they readily tip over should a car accidentally strike one of them.

Stamp Pad Steadied on Desk by Lead Base

In shipping rooms and other places where stamp pads are used, the problem of keeping them from moving around when struck with the stamps is solved by fitting them with lead bases. This is easily done by pouring the lead into a form and then gently pressing the pad in place while the lead is still molten.—Opie Read, Jr., Chicago.



Stacked Sacks of Flour Held with Canvas Strips

Sacks containing flour or other material may be stacked neatly in high piles, without risk of being dislodged, if canvas strips are placed between each layer as shown.

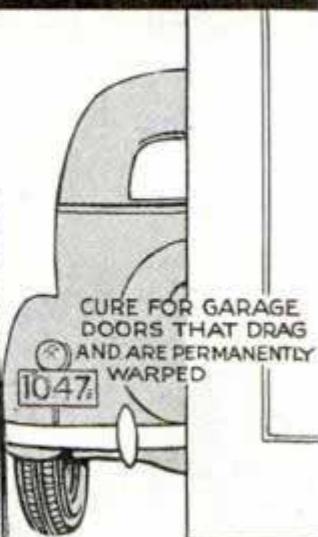
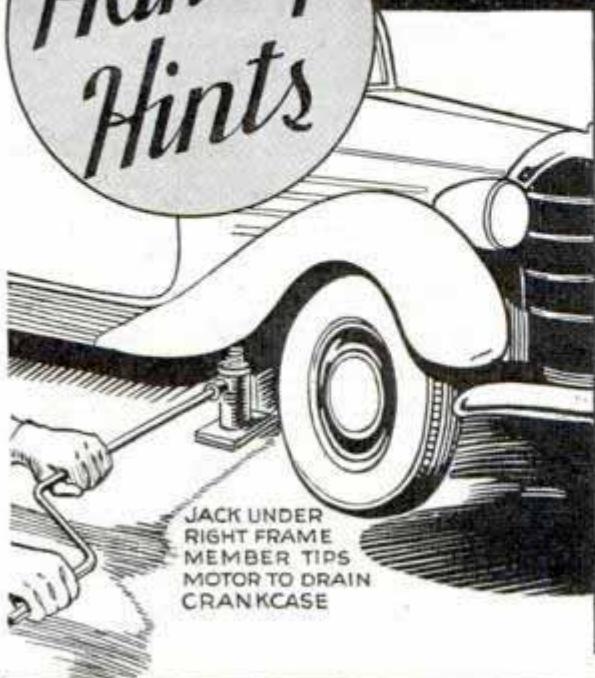


Sacked material readily stacked in high piles, without risk of falling, with aid of canvas strips

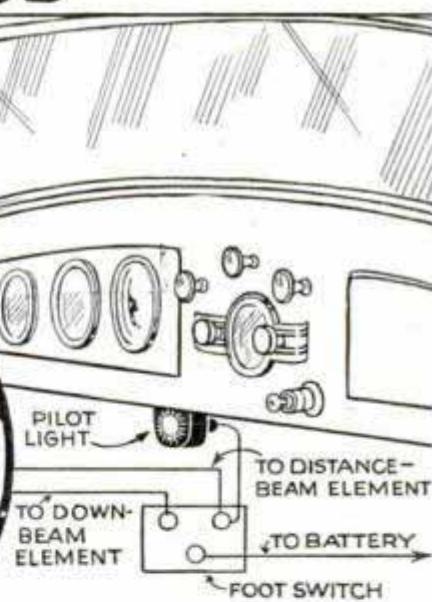
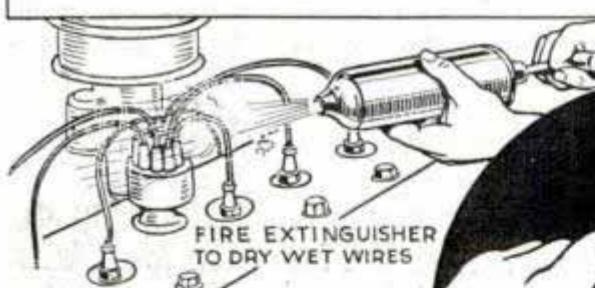
If your fingers slip when trying to lift or carry an object having polished surfaces, a piece of rubber or Cellophane put under the fingers will help in gripping it.

Handy Hints

for the MOTORIST

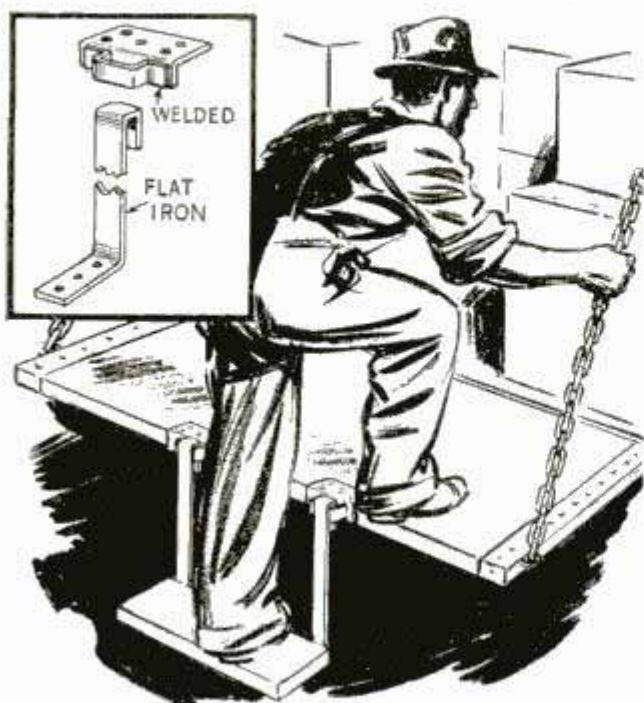


Cars having the oil drain hole slightly above the crankcase bottom will drain thoroughly when one side is jacked up. Right, garage doors that drag provided with hinged flaps, which are raised to open them. Below, a fire extinguisher charged with carbon tetrachloride dries wet ignition wires



Center, an ink eraser is handy for polishing contacts in a distributor cap without any risk of damaging them. A pilot lamp mounted on the dash will light up and show the driver when the headlight distance beam is on if it is wired to the foot switch as shown above. Left, on cars having the starter switch combined with the accelerator, the hand throttle should be used when starting with a cold motor, as an attempt to go directly from starting to acceleration while the motor is still cold and balky often results in chipping the flywheel teeth

Body of Truck Is Entered Easily with This Removable Step

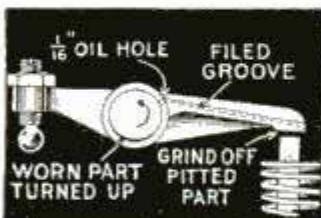


Truck drivers who make many stops in delivering their loads will find this step a timesaver

On trucks where the body is so high that it is hard to enter it at the rear, this removable tailboard step will help you. Made from a couple lengths of flat iron and a wood block, the step hooks into two brackets screwed to the edge of the tailboard. When not in use, the step is carried in a frame mounted under the body, or it can be stored inside within easy reach.

Silencing Noisy Overhead Valves

If your car has an overhead-valve motor and you find that no matter how carefully the valve tappets are adjusted, they are still noisy, the trouble is caused probably by depressions worn into the rocker arms where they contact the ends of the valve stems.



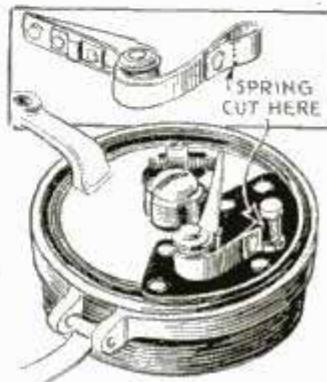
As a feeler gauge bridges this depression, when inserted between the tappets, the valve adjustment will be inaccurate an amount equal to the depth of the depression. To remedy this trouble, remove the rocker arms and grind the ends flat. While you have the arms off, see if the underside of the shaft on which they fit is worn.

Wear here also causes a tapping noise and can be eliminated by turning the shaft so that the worn side is on top. It is also a good idea to drill a small hole through each rocker bearing and then file a small groove from the hole to the end of the arm which assures getting oil on the surface contacted by the valve stem.

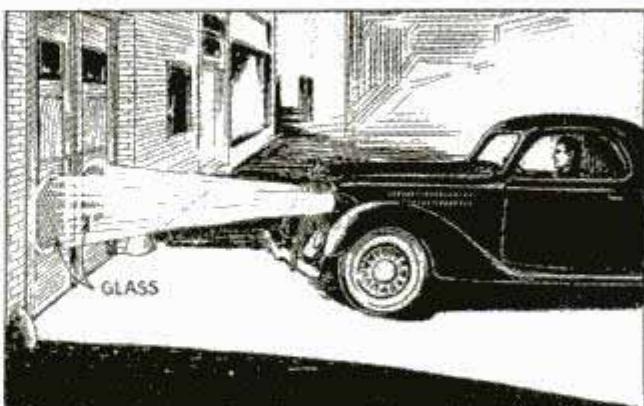
—E. A. Corfar, St. Petersburg, Fla.

Installing Ford Distributor Points

Here is a method of quickly installing distributor points in model-A Fords. Just remove the old point arm by breaking out the loop in the end of the spring so that it can be slipped off its anchoring post and lifted out. Then cut the loop in the new arm as indicated in the detail and file or grindaway enough of the spring to permit the loop to slip around the post. Renew the screw point and the job is done. If a few altered point arms are kept on hand, the job of installing them for a customer can be done in a couple of minutes without disturbing the motor timing.



Glass Windows in Garage Doors Warn of Approaching Car



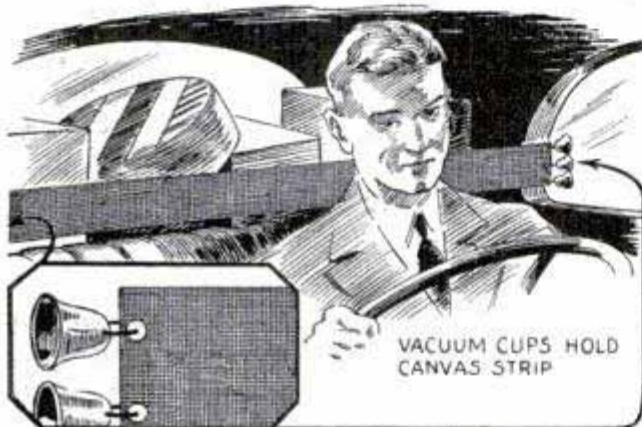
Headlights shining through windows in garage doors warn night attendant of car awaiting admittance

Two wire-reinforced glass panels set in the garage doors at the position shown, will admit light from the headlamps and

serve to notify the night attendant that a car is waiting to be admitted. Also, the glass will pass beams from the headlights when a car is about to leave the garage, and warn pedestrians as they approach the driveway to the street. Such warning is especially convenient when the doors are remotely operated from the garage office.

Package Rail on Coupe Seat Is Removable

Many coupe owners like to carry packages on the shelf or ledge behind the seat, but the ledge is often too shallow to keep large packages from tipping forward when the car is stopped. One owner stretches a



Stretched across a coupe between the windows, a strip of canvas holds packages on seat ledge

strip of canvas across the car just above the seat and attaches the ends to the windows with vacuum cups as shown. When not needed, the canvas is rolled up and stored in one corner of the ledge.

Wanted—More Auto Kinks!

Simple things that will add to the convenience of driving and touring—easily made repairs for minor troubles and disorders of cars—precautions that will avoid troubles—these are some of the many things motorists would like to know about. Possibly you have devised something for your car or garage that will be helpful to thousands of others. Just describe the idea briefly but completely, illustrate it with a sketch or photo and let's have a look. Perhaps it fits in with our needs and if so, a check will be sent promptly. Avoid old practices, ideas that are of use only occasionally or those that involve too much trouble and expense. Ideas accepted must be found workable by actual practice.

Address Technical Editor

Rolling Shelf in Greasing Pit Saves Time and Labor



Holding tools and parts, this shelf is quickly moved to any part of a greasing pit

For convenience in selecting tools and in handling assembly parts without stooping or lifting, one mechanic installed a rolling shelf in the greasing pit. The shelf, about 1 ft. wide, is suspended from iron rollers that travel along the top of the pit.

Police Officers in Squad Car Aided by Extra Mirror

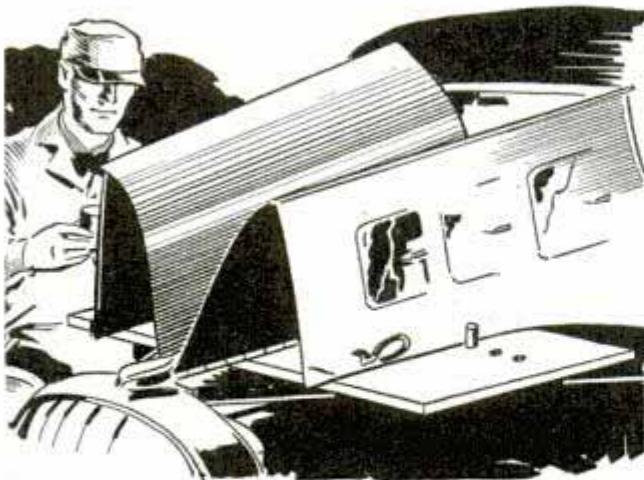
In police squad cars where an officer rides in each seat, an extra rear-view mirror suspended from the car top as shown, will enable the officer in the rear seat to see behind the car as well as in front



Extra mirror in squad car enables officer in rear seat to see behind car without turning his head

without turning his head. The mirror can be suspended with short rods and clamps, or a special bracket may be made of sheet metal and screwed or bolted to a cross member of the car top.

Hood Is Removed Single-Handed with Aid of Support Board



It's a simple matter to handle a large, bulky auto hood with this wide board

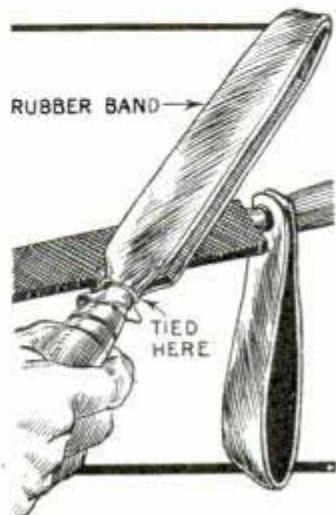
The difficult job of removing or installing a large auto hood single-handed is simplified with this device, which consists of a wide board having a number of holes drilled in line, near each end, to take wood pegs. In use, the hood is raised, the board slipped over the radiator braces and the pegs adjusted to hold the hood. Then,

after loosening the mountings, one man can easily lift the assembly and set it aside.

—Ben C. Robinson, Newcomerstown, O.

File Shielded in Tool Kit with Rubber Strip

When a file is carried in a tool kit, it's a simple matter to protect it against damage from other tools by using a rubber strip cut from an old inner tube. The ends of the rubber can be tied to the file handle, or holes can be made and the ends slipped over the tang after which the handle is forced on. This method of attachment makes the rubber quickly removable when the file is to be used and eliminates danger of mislaying it.



The Next Issue

COPPER AND NICKEL PLATING WITHOUT CYANIDES

With this new method, solutions for electroplating with nickel and copper are made without using deadly poisonous cyanides. These solutions make it possible to plate easily zinc and zinc-base die castings which are difficult to handle with the cyanide plating solutions.

RIGGING AND STEERING MODEL YACHTS

A nationally known designer of model yachts tells you how to rig the sails and arrange the deck fittings and running lines to get the most speed.

MODERN FURNITURE FOR ANY ROOM

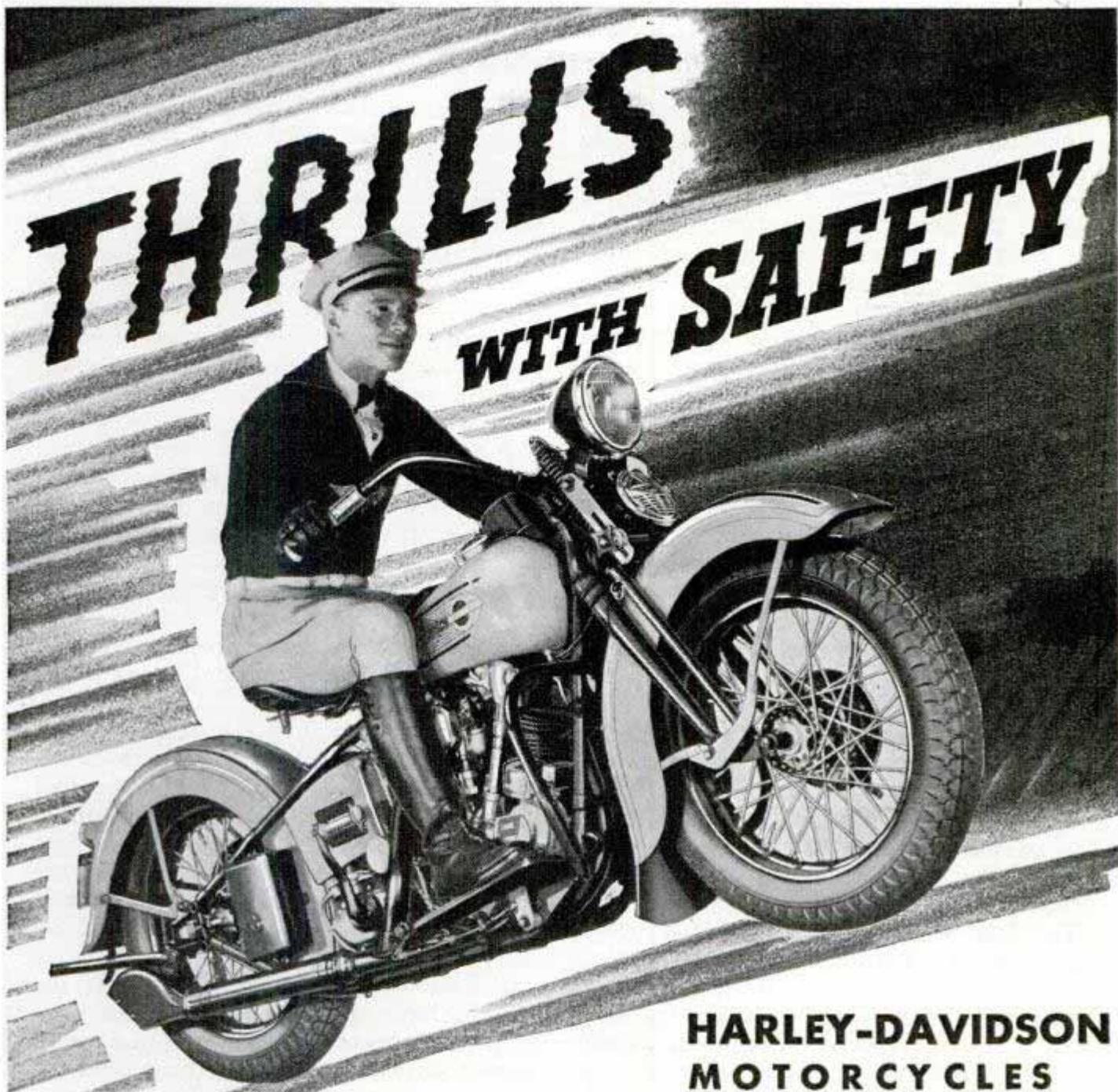
Smart desk has sliding leaf to hold typewriter at the right height. Also, a tubular smoking stand with gleaming metal legs and Bakelite beverage tray.

KNOW YOUR WOOD-BORING BITS

Shows the various types of bits and tells which to use for different boring jobs as well as how to sharpen them for use in both hard and soft woods.

ARE YOU BUYING A BOAT?

Chock-full of information on how to find a good value in a used boat—just what to look for and what to avoid, from a rowboat to a large yacht.



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Lots of style—fast get-away—zooming speed—power galore—and a gliding ride that's smooth and trouble-free. Sure thing—these streamlined 1937 Harley-Davidsons are ruggedly built—have perfect balance—instant response of power when driving conditions demand—and dependable brakes both front and rear for quick, easy stops. . . Yes, plenty of thrills—go where you will—get there quickly, safely and economically in the saddle of a 1937 Harley-Davidson. . . See your nearest Harley-Davidson Dealer RIGHT AWAY. Take a FREE ride on a 1937 Harley-Davidson—ask about his Easy Pay Plans. And send in the coupon.

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 31 years and up, under 16 years.
Check your age group.

F488

The Latest in the Movies

(Continued from page 389)

"rifle" because of corrugations similar to the rifling in a gun barrel, now is used to diffuse the light. Other aluminum reflectors are brushed and chemically treated. While the older light units employed polished glass optical reflectors which often broke under the extreme heat, the newer units have chromium-plated brass reflectors. A lens patterned after a lighthouse lens also is now used for focusing and diffusing light.

The most intense light now in general use is the "solar spot." So intense is the light from the 5,000-watt bulbs used in these units that a special arrangement in the focusing device is needed to prevent them from being focused to a narrow crossbeam which would immediately start inflammable material burning. In the earlier equipment, such lights were used to light cigarettes when the "juicers" ran out of matches. While the solar spot emits the more intense light, the sixty-inch sun arc is the largest light unit in the studios. Two of these now in use for sunlight effects at Metro-Goldwyn-Mayer are set on huge stands adjustable to twenty-two feet high. These lights have reflectors of optically polished glass five feet in diameter. The huge reflector gathers and throws a beam from a 150-amp. arc.

Arc lights are used in filming color movies because of a better spectral balance in the illumination emitted. Lamps used in filming black-and-white movies emit more yellow light than is desirable for color filming, while the arc light has more of the needed blue. Lamp bulbs ranging from two-tenths of a watt to 10,000 watts are regularly used in the studios. The small globe, about the size of a match head, is used in miniature sets, while the large globe, about the diameter of a dinner plate, is used for illuminating real settings. Another globe has three contacts and two filaments. By proper switching, three different light levels are produced. Tubular "lumiline" lamps also are used. They may be "buttoned" together, end to end, to form a continuous band of light for decorative effects.

Ultraviolet light instead of white light also has been introduced in talking-picture recording. Heretofore high-pitched

voices have sounded sharp-edged, and the high pitches and overtones of instruments have been lost, due to the inability of sound recorders to make a sharply defined photograph of the high frequencies of sound. By filtering the white light used in making the sound record and using only the one wave length of the violet portion, it is possible to obtain a sharper focus of the sound light ray image. Thus a more faithful replica of the original sound is photographed.

A machine for making artificial cobwebs is in general use about the studios. It consists of a small drum and a fan anchored to the shaft of a portable high-speed motor. In the drum is placed a mixture of liquid rubber and fuller's earth. When the drum is revolved a thread of the mixture is forced by centrifugal pressure through a fine jet which is dried and blown about the setting by the fan.

For making lightning flashes, Harry Redmond of R.K.O. studios uses a barrel of salt water for a resistor and a ten-foot scissorlike arrangement with an arc at the tips for making the electric flash. Two electrode connections in the salt water are moved for the desired resistance while two bundles of carbons at the end of the scissor arrangement make the arc.

For atmospheric background effects, the studios have special equipment for projecting movies of foreign scenes to a transparent screen. In front of the screen the actors sit in automobiles, boats or airplanes while a camera combines both the projected image and the foreground picture. A more advanced form of this type of projector is the George Teague device which can fabricate airplane barrel loops, falling effects, fast and slow motion and various other illusions.

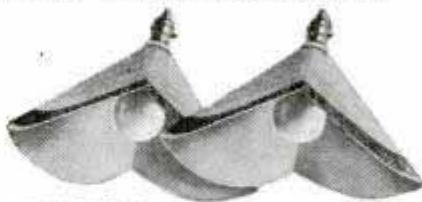
In all motion-picture equipment, the general trend is toward lighter and more durable construction. Today engineers design carefully and spend much money in order to get efficiency and light weight.

Names and addresses of manufacturers and dealers in articles described in this magazine will be furnished by our Bureau of Information upon request accompanied by stamped, self-addressed envelope.

1 Kodak "SS" Film in your camera



2 Two or three Photoflood Lamps and Reflectors



Everything you need to make snapshots at NIGHT



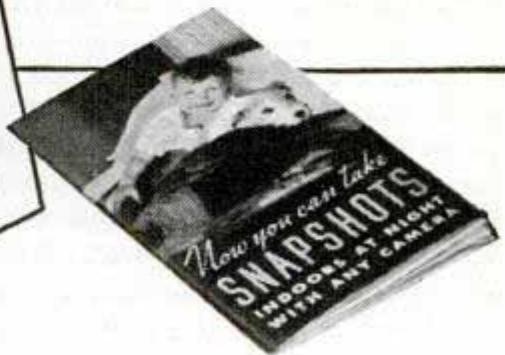
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F/366

Air Liners to the Rescue

(Continued from page 408)

the Mendoza river began to rise, a pilot flew up the river toward its source. In two hours he had climbed over 18,000 feet and was approaching the crest of the Andes. He circled over the Del Plomo glacier and saw that the glacier itself was blocking the path of the Rio del Plomo which in turn fed the Mendoza river. He saw more than this. A seventy-five foot wall of water was racing toward the Mendoza river and the towns and bridges in its path.

Quickly he ordered his radio operator to get in touch with his base which in turn notified all of the towns along the river. By the time the flood waters reached them, although they carried roads, bridges and houses in their path, the inhabitants themselves were safe.

To the skipper of an air liner the saving of a single human life is of as much concern as saving an entire town and there are many reports in the files of the airline companies of pilots who sped on missions to help individuals in need of medical treatment.

Recently in the West Indies, at St. Johns, Antigua, a man lay dying of a strange sickness. Doctors said there was a chance of saving his life if they had a certain serum, but the nearest supply was in Miami, nearly 2,000 miles away. That was all Moody Stuart at the Pan American base wanted to know. Over the air line's radio crackled the life or death message. Division Traffic Manager Dobbs in Miami dashed from one medical supply house to another until the necessary serum was found. And within an hour the life-saving substance was on board the West Indies Express en route for St. Johns. It reached there in time to save the man's life.

On regularly scheduled runs the skippers of the air become thoroughly familiar with the terrain over which they fly and develop a sixth sense which enables them to render aid from the sky sometimes before that aid is demanded. It was this sixth sense which enabled Capt. L. H. Hart to summon aid for a trawler which he sighted from the pilot's compartment of a Pan American flying boat. When he radioed the request for aid, it was discovered the owners themselves had not yet been informed of the trawler's predica-

ment. Flying skippers also have warned railroad engineers of washouts ahead of them, and in many other ways given timely warnings which have resulted in the saving of lives and property.

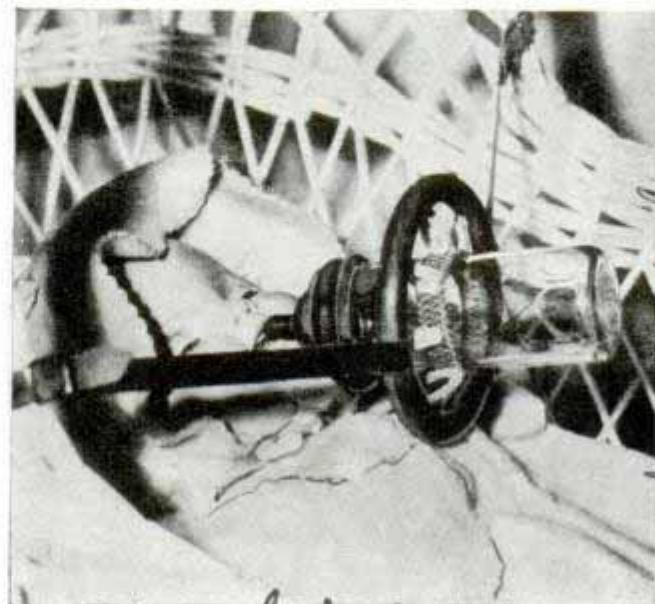
In adopting the code of the sea, air liners have also sped to the aid of their own brothers, effecting more rescues of disabled flyers than other types of conveyances. Col. Gustavo de Leon, a flyer of the Mexican army, was found by flying skippers of the Cia Mexicana de Aviacion after he had been missing for fourteen hours on a flight between Brownsville and Tampico. His rescue is but one of many which the flying skippers have to their credit. Recently when Merrill and Richman came down in Newfoundland, it was a flying skipper, Captain Eddie Rickenbacker, general manager of Eastern Air Lines, who flew to their rescue.

And thus, from day to day the rescue work from the air goes on. The flying skippers, prompt to answer an SOS have their own way of applying the traditional code of the sea to fit in with the faster, thoroughly scientific liners which they fly.

F/6 35

Bottle Holder for Baby's Crib Is Also a Teething Ring

A combination teething ring and bottle holder recently invented can be mounted in the crib or cradle with straps, providing self-service for the child at mealtime and something to chew on the rest of the day.



no information

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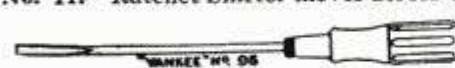


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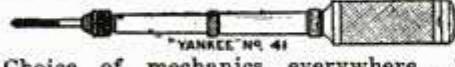
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Spiral with spring in handle. Drives screws one-handed
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Spiral Ratchet Screw-driver. Without spring. \$3.00.
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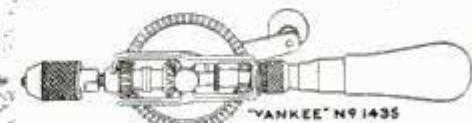
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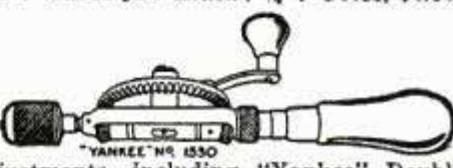
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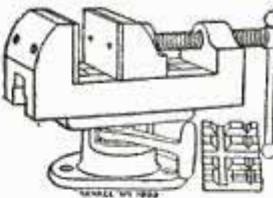
to slow, for easy drilling through. Changed at a finger-touch. Length, 11". Three-jaw chuck: $\frac{1}{4}$ ". Price, \$4.50.

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"Yankee" Vise Clamp. At-
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No. 2100.—Bit Brace by "YANKEE." Advertised Price,
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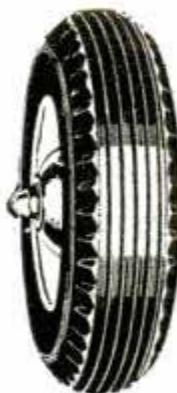
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Mighty Midgets of the Speedways

(Continued from page 397)

twelve inches in diameter. The driver squeezes into a tiny cockpit behind a Pyralin shield that partly protects his head from the flying dirt. The pan under his feet is only four inches off the ground and the center of gravity of the entire car is much lower than in ordinary race cars. The motors must be not more than 100 cubic inches in displacement and a car cannot be more than 110 inches in overall length.

In the early days, every kind of power plant available was used, including supercharged motorcycle engines, small automobile engines, one bank of a stock eight-cylinder engine, and small marine engines and outboards. Four-cylinder outboard engines are still popular and on many tracks are as fast as the more expensive special Offenhauser engine that has been developed for the sport. The outboards are often temperamental and the drivers have to ride high around the tracks because with poor acceleration they dislike shutting down to ride the inner rail around the turns.

Many leading drivers are now using an Offenhauser engine that develops one horsepower per cubic inch of displacement. Equipped with a supercharger and using a compression ratio of 11.5 to one, as much as 150 horsepower has been developed by the midget racing motor. The "Offie" is a four-cylinder overhead camshaft engine with a high-pressure dry-sump oiling system. The engine block is iron alloyed with twenty per cent of steel rail for toughness. The crankshaft is turned down from a chrome-nickel-molybdenum block and is hollow drilled. Likewise, the connecting rods are tubular for lightness. Costing \$1,200 as against only a few hundred dollars for an outboard, these engines rarely need repair work and go through a racing season with hardly any attention aside from valve grinds. Depending on the kind of power plant used, a complete midget racing car costs from \$1,500 to \$3,000.

Today there are more than fifty major midget tracks in this country. Most of them are a fifth or a quarter of a mile around. Some are paved, some are dirt,

some are flat and others are banked, providing a variety of surfaces to test the skill of the drivers. At up-to-date plants such as the Gilmore stadium in Los Angeles, all the color of the big race tracks is provided, with electrical timing devices, pits where the cars are serviced and fueled, colored warning lights along the outside rail, and a floodlighting system, since most midget races are held at night.

Several hundred professional drivers devote most of their time to the sport, and leading racers such as Bob Swanson, Ronnie Householder and Carl Young may earn hundreds of dollars per week. The total purse for a night's program may amount to \$1,500 but the best driver rarely wins more than a couple of hundred of this since the prizes are divided between the winners of many events. On the other hand, a busy driver may compete in five or six race programs during one week.

Transport Plane Is Theater for Preview of Sound Film

Flying over New York, a movie audience in a passenger plane was given a preview of a sound picture. Silent films had been shown in airplanes previously, but introduction of sound on this occasion was made possible by special cells. Appropriately, the story of the picture concerned an air-line hostess.



Movie projector set up in aisle of transport plane gives passengers a preview of a new sound picture

Junior Scout

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Think of it! Only \$195 for a genuine "twin"! It's the lowest price for a "twin" in American motorcycle history—and it's an Indian engineering triumph! Snappy style—easy handling—flashing power to streak you up to the head of the parade—and economy that averages 70 miles to the gallon easily.

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31 years and up under 16 years

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● What a marvelous opportunity for homecrafters! Just look at these stunning pieces of modern living-room furniture. Designs that heretofore have been exclusive only with the world's finest furniture manufacturers—never offered before in any project service. And now Casein Company, makers of the amazing heatproof, waterproof CASCO Glue, offers them to you in the 1937 CASCO Free Project Service. Eight of them in all. Internationally famous Gilbert Rohde designed them exclusively for CASCO. You'll want to build several of the Rohde Group. And you can...easily...with the all-inclusive plans which CASCO offers you free.

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F 14 69
Power Plow for Sidewalks
Cleans off Dirt, Snow



Built with narrow tread, this plow is handy for clearing snow off sidewalks



Round Occasional Table



Desk with Concealed Typewriter Drawer



Folding Card and Game Table

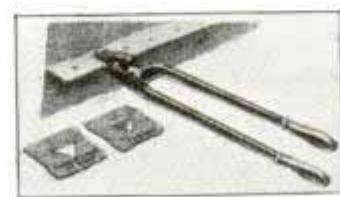
Cleveland Tractor Co. Are Clearing Snow

Designed with narrow tread for operation on sidewalks, a power plow for clearing away dirt or snow is useful the year around. The plow mechanism has an automatic trip spring which adjusts the blade to the surface over which it operates, moving up or down. A large guide wheel in front enables the plow to mount curbs without hand manipulation and to start plowing clean from the edge of the curb. A four-cylinder engine, which gives a speed of four miles per hour in high, drives the plow.

F 16 47

Sheet Metal Clipped Together by Handy Punch

For fastening together sheet metal, a new tool punches out a triangular "ear." When folded down this ear gives a secure three-way lock. The flat nose of the tool permits access to tight places. Any type



of seam, plain, folded or overhanging, may be fastened in this manner.

*Whitney Metal Tool
P. O. Box 620*

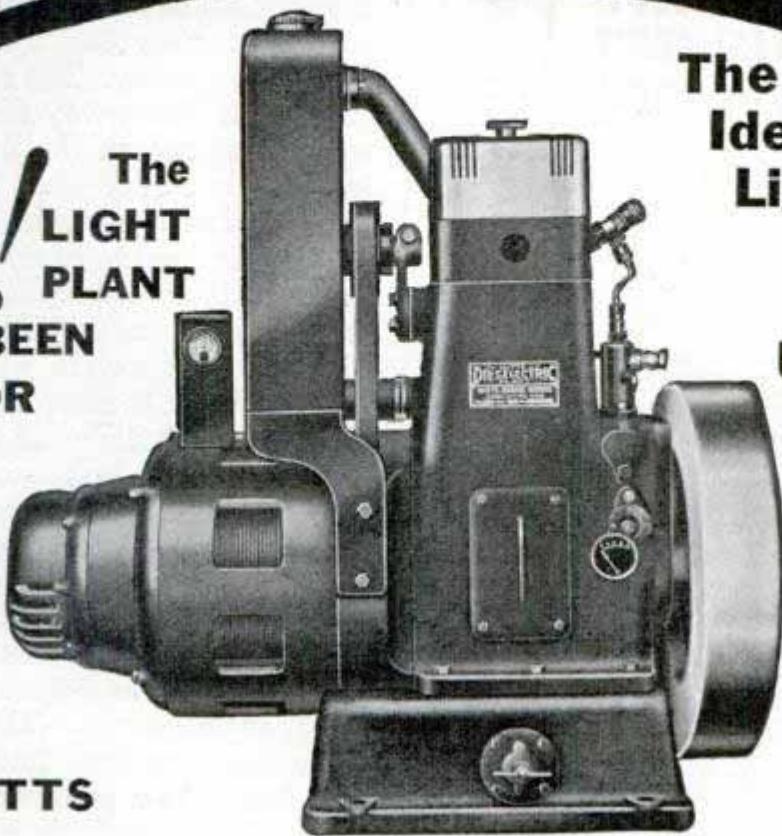
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**Unbelievable
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**Cuts Light
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At last it's here! You have never seen a plant like this—there has never been one like it! Full 1600 watts, uses cheap non-explosive fuel, and made in three styles, complete with switchboards. A modern mechanical marvel. Here indeed is the plant you have been waiting for.

Make your own electric light and power at the lowest price per kilowatt hour ever guaranteed in a small plant, "Less Than One Cent per KILOWATT." This is made possible by the WITTE Vertical Diesel Engine. Small, compact and direct-connected to the generator of your choice and operating at medium speed for long generator life. Heavy balanced flywheel for steady, flickerless light. The 110 volt AC and 110 volt DC plants have no batteries and are run when current is wanted. Belt power can be taken off engine pulley when full output of generator is not being used.

For those who prefer a plant with batteries the 32 volt Dieselectric will prove most satisfactory and furnish electricity at a decided saving. Same general description as the 110 volt plants but designed for use with standard 32 volt farm light plant batteries. Battery charging costs lower than ever thought possible. Make 1937 the start of a new era of better living—get a WITTE Dieselectric for greater comfort, convenience and economy.

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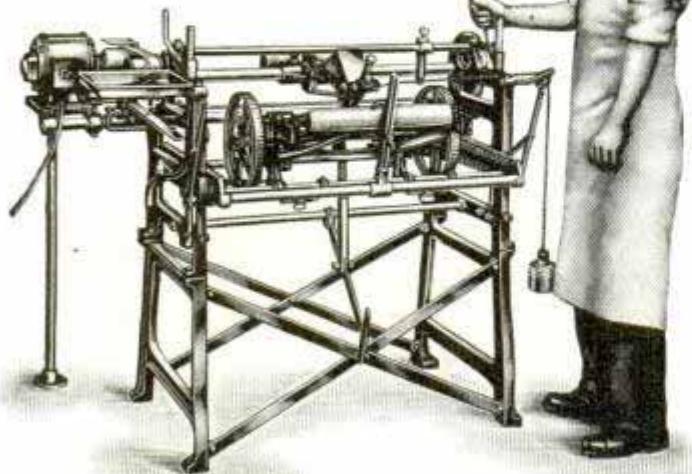
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Makes old, dull lawnmowers cut like new. Mowers run easier, stay sharp longer—customers come back year after year. Start right at home. Attach the Ideal to your lamp socket. Sharpens any make of mower in 15 to 20 minutes—you get \$1.00 to \$1.50. Attachments for grinding skates, grass shears, hedge shears, sickles, scythes, axes, etc.

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Dearborn, Mich.
Without obligation, send me new 1937
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Name _____
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F119 Fishing Through the Ice

(Continued from page 415)

One is to dump a small can of chopped minnows, slightly cooked, into the lake through a hole near the fishing shack. The cooking makes the minnows heavy so they sink quickly. The other is to lower a can of the chum way down into the deep water underneath the fishing holes. This involves a clever trick in order to open the can after it is on the bottom.

The can used to carry chum to the bottom is just an old tobacco tin. In the top is inserted a small piece of iron pipe to give the box weight so it will go down easily. When the cover is fastened on the box it presses down on a loop in the line. As soon as the box is on the bottom the fisherman gives the line a jerk. It pulls against this loop which opens the cover of the box and lets out the chopped minnows.

On a clear lake you can see way down, possibly fifteen or twenty feet. Slowly going toward the bottom are the pieces of chopped minnows. Then up come the ciscos, darting here and there to pick up the food. You see twenty or fifty in a school. Here is where the fisherman works his lure steadily to get a strike. Ciscos have tender mouths and require easy handling. When you catch a pickerel or a bass or a walleye you don't have to worry much about the hook tearing out. This is especially true if you coil several feet of line on the ice so the striking fish can run with the live minnow and get it well in its mouth before the line tightens. Then the hook is apt to be well set.

But with ciscos the tactics are different. You sit on your seat over the hole in the ice. You let down the line to the depth frequented by the ciscos. Tie pieces of colored yarn on your line to indicate the number of feet payed out. Jerk the hook with beads on it up and down by bringing your wrist and fingers upward. This moves the baited hook sharply. When you feel a hit you jerk quickly but not too hard. If you set the hook with a powerful swing you may tear the barb out of the mouth of the fish. So be quick on the jerk but gentle.

To some sportsmen unused to much winter weather the clothing outfit is even more important than the tackle require-

(Continued to page 124A)

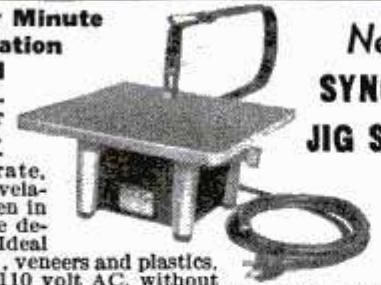
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Electric Operation

No Motor Required

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STANDARD GARDEN TRACTORS

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Powerful Gas Tractors for Small Farms. Gardeners. Florists. Nurseries. Fruit Growers & Poultrymen

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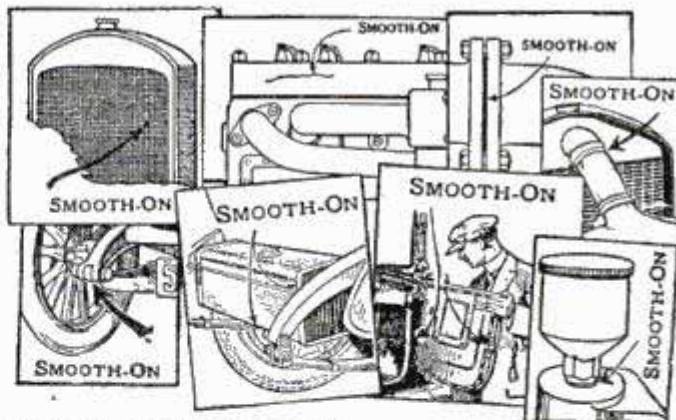
3221 Como Ave.

2546 Market St.



New York, N.Y.

290 Cedar St.

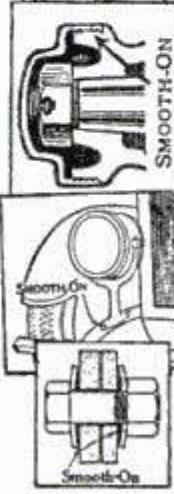


SAVE MUCH MONEY ON AUTO REPAIRS

With Smooth-On No. 1 you can make the following repairs easily, quickly and usually at almost no expense.

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of water from a frozen, punctured or corroded radiator (nothing put inside), from a cracked engine jacket or from a loose hose connection; of lubricant from a cracked crank, gear or differential case or bad joint; of gasoline from tank or line joint; of exhaust fumes from manifold, muffler or heater connections.



MAKE LOOSE PARTS TIGHT

Smooth-On No. 1 makes solid connections—keeps lubricator terminals, grease cups, hub caps and nuts from backing or dropping off; tightens loose fenders, lamp, tire and license plate carriers; makes screws stay tight in hinges, locks, robe and foot rails, window and dash mouldings; tightens loose spring bushings to prevent wear and squeaking. A bolt with Smooth-On No. 1 under head and nut washers makes a strong replacement for a weakened rivet.

Smooth-On No. 1 metallizes quickly, holds perfectly on any metal and is proof against vibration and heat. Anyone can get thoroughly satisfactory results by following the illustrated directions in the free repair booklet.

Send for your copy, and get Smooth-On No. 1 in 7-oz., 1-lb. or 5-lb. can from your hardware store or if necessary from us direct.

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LUBRICATES • CLEANS • PREVENTS RUST

F119 (Continued from page 122A)

ments. Many find high-top rubber pacs better than leather boots for comfort, especially in fairly mild weather when, during the middle of the day, the ice may get sloppy. These pacs have rubber bottoms up to the ankle and leather tops. The latter may be oiled so they are waterproof. Get a pair large enough to take warm felt inner soles. Wear plenty of socks in the pacs, a pair of light wool plus heavier wool outside. Put on woolen underwear, wool pants, flannel shirt, and a sweater if necessary. Or, better yet, put on a leather, wind-resisting underjacket if the wind is blowing. For an outside garment many like a big Mackinaw coat with a high collar. For headgear some prefer a woolen cap with ear flaps.

Ears, hands and feet are the body points that usually turn the tide between comfort and discomfort when on the ice. So the right kind of mittens or gloves also are important. Some like to carry a couple of pairs of woolen mittens although on some of the coldest days they work the lines with just cheap cotton gloves, take fish off the line with bare hands and then retire fingers to a coat pocket in which they have a heat pack going. This heat pack generates heat by the addition of a small amount of water and on a cold day it may be worth its weight in gold.

Last but not least, is the matter of ice grippers. The old-timers like a pair of metal grippers that fasten on a boot or shoe and dig into the ice, enabling them to walk or run without slipping. They are handy although not absolutely required.

F1521

Rubber Drip Molding for Car Fits Top of Door



Requiring no tools for installation, a simple rubber drip molding is available for automobiles. It fits at the top of the door and stops roof drainage from dripping into the car. The molding can be sprayed or painted to match the automobile. It fits ninety per cent of the cars now on the road.

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New HULL AUTO COMPASS



Saves miles of travel in wrong direction. This handsome, STREAMLINE Airplane Type Compass keeps you on the right road. Easily installed. 3½ inches high. Bakelite case, sapphire bearing. Built-in compensator. Only \$2.95 POSTPAID. SATISFACTION GUARANTEED.

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Airplane Type. 1½-inch diameter. Sticks to windshield. Guaranteed. With separate compensator, only \$1.95 POSTPAID.

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JIGSAW \$150

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"The Jigmaker" cuts wood up to 2" thick

Including 12 assorted blades, Adapters, Illustrated Manual, and roller Saw Guide formerly found on expensive machines only. All metal, 15" long, 8" high, 6½" table. A swift and easy cutter—best ever made for the money.

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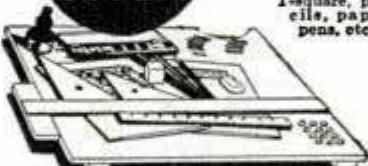
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INVENTORS Be Sure to See Page 23A

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IDEAL-O, 122 East 25th Street, New York City

Tune in Records on Receiver

(Continued from page 420)

circuit of your broadcast set is necessary.

A schematic diagram is given in Fig. 1 and a simplified wiring diagram showing all connections under the base, appears in Fig. 2. Details for winding coil L₁ are given in the sketch at the left; this coil is close-wound on Bakelite or cardboard tubing. Note that the .00025 mfd. fixed condenser (C₂) is mounted inside this coil with the grid lead for the 6D6 tube projecting out through the top of the coil shield can, which is 2 in. in diameter and 3 3/4 in. high. Photos, Figs. 2-A, 2-B and 2-C show the assembly details clearly.

The sheet-metal base is 6 in. long, 5 in. wide and 2 in. high. Coil L₂ is an ordinary 39-cent, unshielded 80-mh. r.f. choke with

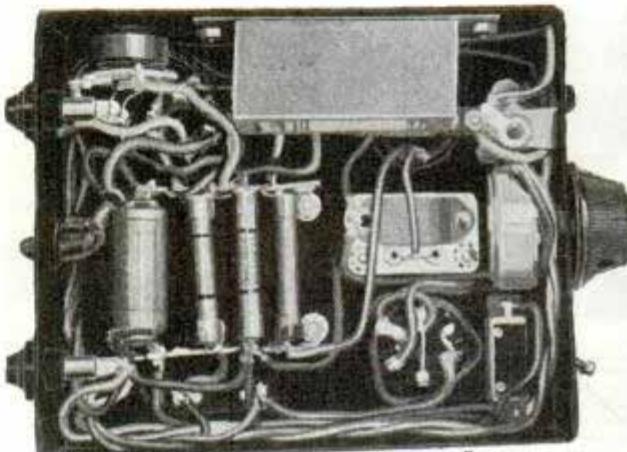


FIG. 2-C

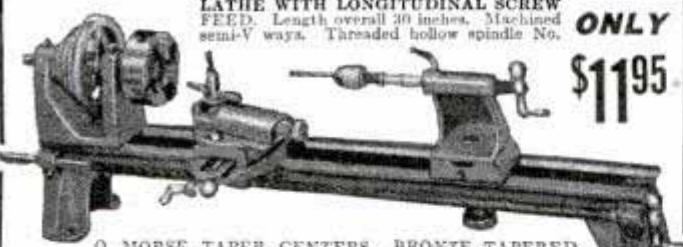
an additional winding of ten turns between the r.f. coil and its terminal board. Both leads from this second winding go directly to the twin output jacks "to radio." A 100,000-ohm potentiometer (R₄) is used for the gain control for percentage modulation but does not control the output of the oscillator, therefore the coupling to the antenna lead-in should be adjusted for best results. In extreme cases, leads from both "to radio" jacks must be used; one connected to the ground post and the other to the antenna post on the set, using a switch to cut in the regular antenna when required for broadcast reception. A list of the parts used in the original model can be obtained from Popular Mechanics radio department upon request, without charge.

A microphone may be connected into the oscillator if desired. The microphone connection is shown to the right of the dotted line in Fig. 1. This enables the operator to use his receiver for public address.

NEW SCREW FEED LATHE

No. 355-6 x 18-inch METAL TURNING LATHE WITH LONGITUDINAL SCREW FEED. Length overall 30 inches. Machined semi-V ways. Threaded hollow spindle No.

ONLY
\$1195



O MORSE TAPER CENTERS, BRONZE TAPERED TAKE-UP BEARING, $\frac{1}{2}$ inch tailstock set-over. Compound carriage travels on semi-V ways gibbed for take-up. Included: Two 60° centers, tool post assembly and 4 inch face plate.—3 inch four jaw chuck \$3.50; 4 inch chuck \$4.50; sidebar bushing 50 cents. Send \$2.00 with order, balance C.O.D. Shipping weight 30 lbs.

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Word of It.



Listen

Most of the ads in this magazine offer a chance to SELL something and make a profit for yourself. By my plan you DON'T SELL ANYTHING. You don't have to convince anyone that they want your product. You don't ask anyone to give up their money.

YOU START OUT BY Giving Something Away

You give it away absolutely FREE to anyone who wants it (and there are millions, actually MILLIONS of people who want it). There are no strings attached. No tricks. No schemes. You just walk into a factory, office or home and hand out something absolutely free. Then you walk away. Easy?

It's so easy it sounds like a "get rich quick" scheme—but it's not. It's a sound, substantial business that is growing so fast there is no way to tell how much will be made this year—maybe millions.

Now, here's the second step. A few days after you give away the first articles, the men or women you gave them to call you up or send you a postal card. They ask you to bring them something else. You take it to them. When you make the delivery they each hand you \$6.50 in cash. This goes in your pocket—it is yours!—over HALF of it is PROFIT!

You can give away thirty or forty items a day. People are glad to get them. If only half of them call you up—you make over \$3.00 on each one—so that would be \$45 a day. Davis of Ohio wrote me that he made over \$3,000 in three months and his records showed that he was telling the truth.

Here's something so HOT it sizzles. I'm ready now to give it to a few more. You can be big or little. You can be satisfied with \$10 a day or you can shoot for \$100 a day. I don't care. But if you send your name on the coupon or a postcard, I'll mail you complete facts—full instructions showing exactly what to do, how to start at once on the strangest money making idea ever invented. These plans won't cost you a cent.

Don't lose a minute. If you want a chunk of the easiest money of your life, go to the mail box or telegraph office now.

N. A. STODDARD 4325 Ravenswood Avenue,
Dept. 123, Chicago, Ill.

N. A. STODDARD, 4325 Ravenswood Ave.,
Dept. 123, Chicago, Illinois

Send me complete instructions—absolutely FREE—showing how I can start right away on your "Give Away" Plan for Big Money.

Name.....

Address.....

City..... State.....

When writing please mention Popular Mechanics

Wood Detective Solves 3000 Mysteries a Year

(Continued from page 362)

material passed through the mill. The Wisconsin wood expert matched part of the materials in the ladder with a single shipment of lumber handled by a certain New York dealer for whom Bruno Hauptmann had worked and from whom Hauptmann had purchased lumber during the interval when the shipment was in stock. One board in the ladder matched with those found in the attic of Hauptmann's home. Koehler also demonstrated before the jury the identity of the hand-plane marks discernible on the ladder by direct comparison with scorings made by one of Hauptmann's planes.

Koehler solves at least 3,000 mysteries a year, many of which outstrip the cleverest imaginings of the most talented writers of fiction. He is qualified to solve all the major and minor enigmas of wood "parentage" and true names irrespective of the disguises or aliases of the materials presented for identification. Twenty years of experience in his unique technical art have trained and seasoned this technical forester. The exhibits which he identifies range from petrified wood perhaps millions of years old to specimens of fossilized wood whose growth in trees dates back some 120,000 centuries.

Once the incoming mail brought two specimens of wood from wrecked ships, long submerged, from an eastern salvage company. One was a hull hunk from an ordinary wreck off the coast of Delaware. The other, so the salvagers wrote, was clipped from the prow of a famous sailing vessel, reputed to have gone to the bottom with \$5,000,000 in gold. The salvagers did not know which submerged hull was the probable gold ship and did not want to raise both wrecks. They asked Koehler to indicate which of the two specimens was off the likely treasure ship.

When wood is submerged in water, it is preserved for hundreds, or even thousands of years. Being bottled up in the sea actually simulates hermetical sealing in a vacuum. Removing the water-saturated coatings of the specimens, he made microscopic specimens of the undamaged central material which displayed rings of growth that facilitated accurate estimates of the ages of the wood when the original

trees were felled. The specimens by their respective cellular peculiarities also enabled the expert to trace the pedigrees and technical derivations. One proved to be dogwood; the other, a species of juniper. These data "blazed" the salty descent to the probable treasure by establishing the geographic region in which each vessel was built.

Litigation involving large shipments of both lumber and sawdust has been settled on various occasions by Koehler's multiple microscopes. In a recent marine survey, government representatives were befuddled by the difficulty of correctly naming samples of wood from the various ships. The hull of a Norwegian vessel in particular remained unknown until somebody consulted Koehler. He quickly tagged the specimen as Scotch pine, or Norway spruce.

A miracle tree is growing from the roof of the courthouse at Greensburg, Ind. The roots of this tree—now fifteen feet high—are anchored in the slate roof of the building. How the tree lived and obtained nourishment in the absence of fertile soil no one could explain until a sample of the wood and its story of growth were submitted to Koehler. He identified the tree as a species of poplar and attributed its health and growth to soluble nutrients which it obtained from the composition of the roof.

Parts of a wooden clock built several centuries ago came to Koehler's desk. Study of the wood cells revealed to the specialist that the gear of the historic clock was made of cherry; the pinion consisted of mountain laurel. The identification of extinct species of wood is one of the most difficult assignments which filters to the laboratory of the wood detective.

A neighborhood dispute developed in a western city because of a clogged sewer line. Property owners objected to the removal of stately curbside trees that fronted the sewer line, claiming that only those which were blocking the sewer pipe with their root growth should be removed. The wood sleuth was asked to unravel the riddle of the guilty trees. Under the microscope, Koehler identified the offending

(Continued to page 130A)

STUDEBAKER

ANNOUNCES

\$10,000.00 IN CASH PRIZES *Free* TO USED CAR BUYERS

ALL you need do to qualify for one of these 452 cash prizes is to buy from an authorized Studebaker dealer a Pledge-backed used car of any make—and then write a letter of 50 words or less stating why you did so. For the best letter, Studebaker will pay \$1,000.00 in cash! For the next best letter, \$500.00 in cash! For the 450 next best letters cash prizes ranging from \$100 to \$10 in cash!

Studebaker is making this sensational offer of \$10,000.00 in cash prizes in order to call attention to the many amazing values in used cars of all makes which Studebaker dealers have taken in trade on new 1937 Studebakers.

2 GOOD REASONS WHY STUDEBAKER DEALERS SELL BETTER USED CARS

1 The famous Used Car Pledge—introduced by Studebaker eleven years ago—assures you honest pricing and fair treatment.

2 You have many makes of cars to select from, including a fine assortment of Studebakers—the make preferred by shrewd used car buyers.

The Studebaker Corporation asked its dealers to take this Pledge eleven years ago.

As years passed, other organizations have fallen in line with varied imitations of this sound policy. But regardless of the wording of the imitations no other organization can match Studebaker dealers in carrying out the spirit as well as the letter of this sound policy.

1st PRIZE, IN CASH	\$1,000.00
2nd PRIZE, IN CASH	\$500.00
NEXT 10 PRIZES, IN CASH, EACH	\$100.00
NEXT 40 PRIZES, IN CASH, EACH	\$50.00
NEXT 100 PRIZES, IN CASH, EACH	\$25.00
NEXT 300 PRIZES, IN CASH, EACH	\$10.00
452 CASH PRIZES TOTALING	\$10,000.00

Studebaker Dealer's Pledge to the Public on Used Car Sales

1. Every used car is conspicuously marked with its price in plain figures, and that price is rigidly maintained.

2. All automobiles which are sold properly reconditioned and carry a 30-day guarantee for replacement of defective parts and free service on

3. Every purchaser of a used car may drive it for five days and then, if not satisfied for any reason, turn it back and apply the money paid as credit on the purchase of any other car in stock—new or used. (It is assumed that the car has not been damaged in the meantime.)



RULES: Buy a Pledge-backed used car from an authorized Studebaker Dealer (the make of car or amount you pay, however small, makes no difference) and then write a statement of 50 words or less on the entry blank the dealer will give you, sign with your name and address (give street and number as well as city and state) and mail to Studebaker, South Bend, Ind. Your entry must be postmarked not later than midnight March 31, 1937. Employees of Studebaker and Studebaker dealers—or members of their families—are not eligible and duplicate prizes will be awarded in case of ties. No entries will be returned. Paul G. Hoffman, President, Studebaker Corp., and staff will be the final judges. Spelling, grammar and penmanship will not count against you. Just give a statement of 50 words or less as to "why you bought a used car backed by the Studebaker Pledge."

Marvelous New Ink Equals or Surpasses U. S. Gov't. Standards in 8 important respects

1. Water-resisting
2. Anti-fading
3. Non-clogging
4. Quick-drying
5. Correct flowing
6. Anti-corroding
7. Non-molding
8. Anti-deposit forming



**Created by The Parker Pen Co.
for Steel Pens and Fountain Pens**

Now—replace your old-style ink with Parker's new \$68,000 ink creation—called PERMANENT Quink. By actual test this revolutionary ink in Royal Blue, Blue-Black, and Black equals or surpasses 8 rigid Gov't specifications listed above. Now you can make your office records as PERMANENT as paper—waterproof and fadeproof. PERMANENT Quink works equally well with steel pens or fountain pens. Quink is anti-deposit forming, 24 times better than Gov't Standard—and is 56% more anti-corrosive.

Parker Quink does what no other ink can do:

1. Cleans a pen as it writes—a Parker or any other pen. Contains a harmless ingredient that dissolves sediment left by pen-clogging inks.
2. Quink dries ON PAPER 31% faster than old-style; much faster than Gov't Standards. Yet, Quink resists evaporation, hence does NOT dry in a pen. Made 2 ways—WASHABLE for home and school—PERMANENT in all standard colors for accounting, office records and documents. Once you try Parker PERMANENT Quink you'll pour your old ink down the drain. And Quink gives writing new distinction because it's always rich, brilliant—never watery. From 2 oz. bottles at 15c up to quarts, 5 gal. jugs and 50 gal. kegs.

**Parker
Quink**
At all stores
selling ink

BUILD THIS 6' YAWL MODEL, ONLY \$1.50

Everything furnished including semi-shaped hull of white pine and mahogany with black water line. All rigging material, airports, pedestal, base, plans and instructions. Mailed postpaid for \$1.50 in U.S.A., \$1.65 Canada. No C.O.D. orders. Our 44 page illustrated catalog listing kits and separate fittings mailed on receipt of 15c.

A. J. FISHER, 1002-1 Etowah Ave., Royal Oak, Mich.



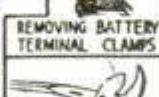
AGENTS

Salesmen—Distributors

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FOR THE PAZZANO

"7 in 1" battery tool from Garages, Filling Stations, Car Dealers, Battery Dealers and Manufacturers. Does the work of 7 tools at the cost of 1. Sells on sight wherever batteries are handled. Exclusive territory. Open. Send \$1 today for Sample Tool, Demonstration Kit, and Order Book.

ACT NOW



PAZZANO WRENCH COMPANY
732 MOODY ST., WALTHAM, MASS.

Wood Detective Solves 3000 Mysteries a Year

(Continued from page 128A)

roots as those of elm trees. It was then a simple matter to demonstrate to the owner of the elms the guilt of his trees and the necessity for their removal.

Uncle Sam was participant in a lawsuit which was won by the testimony of Mr. Koehler. The biological survey purchased a large tract of submarginal land as a game refuge and bird sanctuary. When government representatives sought possession of the land, the former owner claimed that the boundary was marked by three blazed trees, which had been thus designated a decade previously. Mr. Koehler was asked to determine the age of the blaze marks. He decided the trees had been blazed six years later, as shown by the growth rings adjoining the ax marks, than the erstwhile owner contended. The government won its case.

Identification of wood from aged "witness" trees is a rather routine procedure in the Koehler laboratory. Legally these trees, which usually have long served as base marks in land surveys, are of great importance in the definition of property lines. The fact which Mr. Koehler must demonstrate in most such cases is that the snags or stumps, veritable molars of the earth, are of the same wood species as the witness trees described in the deeds.

One wood specimen found in Wisconsin was identified as spruce from a glacial drift. Mr. Koehler estimated the age of that log as 500,000 years. The wood was crushed and flattened by the pressure of the massive load of rock and soil which for centuries had been bearing down upon it. Another log disinterred from a grave during excavations at the Naval Academy at Annapolis was identified as cypress which dated back to the Pleistocene age. A piece of sequoia tree recovered by the reclamation service 150 feet below the bed of the Yakima river in Washington state was identified by Koehler as an early progenitor of the California redwood of today. He fixed its age as 12,000,000 years.

Compression wood forms on the lower side of leaning trees; is not as strong as normal wood; shrinks readily and causes lumber abnormalities. Where compression wood is used in plywood or pencil

manufacture it usually causes bowing and buckling and is a source of commercial and industrial disputes. Such arguments furnish more work for the wood investigator. He also handles many cases involving woods which fail in service under normal loads due to such defects as cellular damage during the growth of the trees. Other breaks are proved the results of overloading and abnormal stresses and strains.

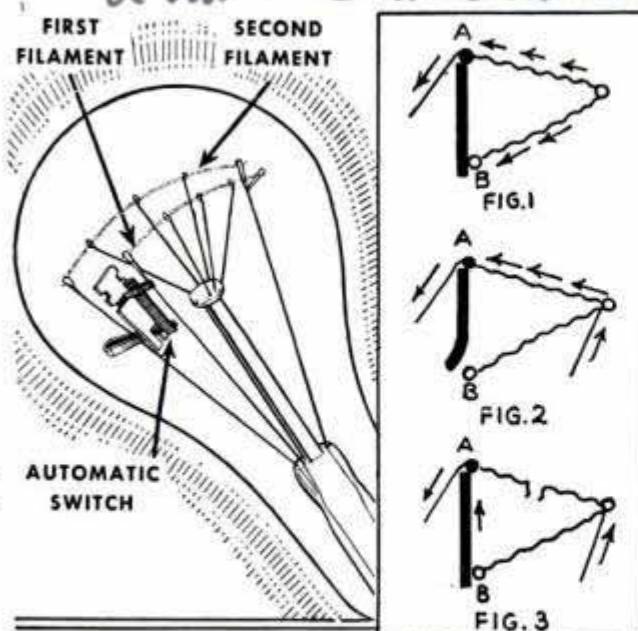
Koehler can even tell the approximate month and year when a hurricane occurred by the examination of native woods in the wind-buffeted area. When a soft-wood tree is bent for some time by a violent wind, abnormal growth is fostered and the rings of growth so affected that the wood specialist can easily translate their abnormalities into definite hurricane data. Similarly, the drainage of swamps writes its indelible impression in tree-ring growth. Tamarack tree rings developed after drainage are larger and whiter than those formed during the waterlogged era.

F/488.

Spare Filament in Light Bulb Doubles Its Life

Costing no more than the present type, a new electric lamp has a spare filament and burns twice as long. An automatic switch effects a new circuit when one filament burns out.

dm. Paul Shwerin



Sketches at right show (top) when light is first turned on; (center) switch breaking circuit on one filament, and (bottom) switch closed to complete new circuit when one filament burns out

*Double-life lamp
Invention No. 2*

Stops Oil Pumping Restores New Car Power

Proved in Millions of Cars



Amazing

Ramco Spring Rings

Revolutionize Entire Piston Ring Industry

TODAY, at a cost which is unbelievably small, you can make your car run like new. Yes, even though the cylinder walls are so "out-of-round" that your car is lousy, and is pumping oil badly, Ramco Spring Piston Rings will immediately restore lost compression—stop oil pumping—give your motor "new car" snap and power. So perfectly are these amazing rings engineered that they exert the proper pressure on cylinder walls at all speeds. Not only seal the motor completely for maximum efficiency, but totally eliminate piston rock and slap. Ramco Spring Piston Rings have revolutionized the entire ring industry to such an extent that untried imitations are flooding the market. Don't take chances with these unproved rings. Ramco Spring Piston Rings are a proved success. Have successfully restored new car pep, power, and oil economy in millions of cars.

Insist upon the genuine, patented Ramco Spring Piston Rings. For further proof of the amazing performance you can expect from your car after these rings are installed, mail the coupon below, and a FREE booklet will be sent to you which gives proof of results millions of motorists have had.

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Please send me your free booklet which shows how Ramco Spring Piston Rings have restored new car pep, power, and oil economy in millions of cars.

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RAMCO PISTON RINGS
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FREE BOOK

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How to Make
50 Fine Things
of Wood

60 pages, over 200 illustrations and diagrams. All about woods—their qualities, and uses. Tells how to choose the right saw for the job. Discusses every operation in setting and filing all saws—unusual uses for saws. . . . An invaluable book for your shop!

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Postal
and
MAIL
TODAY

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Send today for our Big 100 Page Catalog listing hundreds of bargains in Fishing Tackle, Baseball, Basket Ball, Golf, Tennis, Archery Equipment, Guns, Sporting Goods and Clothing of all kinds. Here are some typical bargains:

\$17.50 Fly Rod with Aluminum Case & 2 tips	\$8.95
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8.50 Golf Bag, 7 in. 2 large Zipper Pockets	5.75

All merchandise guaranteed. You'll save if you join thousands of sportsmen who purchase all their requirements at the Gateway. Free Catalog—Yours for the asking. Invaluable to every sportsman. Contains the famous 'Fisherman's Calendar.'

GATEWAY SPORTING GOODS CO.
1332 PM MAIN ST. KANSAS CITY, MO.

CHIPPED GLASS SIGN MAKING MIRROR RESILVERING

Metalware replating; Interesting; Profitable. Write
SPRINKLE, Plater, 129, Marion, Indiana



11263 Around the World by Air

(Continued from Colorado Section)

air with the idea that you are enjoying the ultimate in speed. The proponents of this form of travel aver that "you ain't seen nothing yet." Your three weeks' trip around the world today is likely to be considered slow tomorrow.

There's a real probability that within the near future—say ten years—you can fly to Europe in ten hours and make a trip around the world in ten or twelve days. You would go in a huge plane weighing 100 tons or more—a size already being planned in the minds of designers—and at a speed of 300 miles an hour.

Designers anticipate that greater speed can be attained by flying at high altitudes, up to 30,000 feet or more. Up there you won't need to worry about the weather and you'll ride in a sealed cabin supplied with oxygen. Of course, no engine has yet been built for such flying and no 100-ton plane has been constructed. But when you consider that only five years ago an air trip around the world was a spectacular stunt, it does not require a very active imagination to vision 100-ton ships flying around the world at 300 miles an hour in ten more years. Perhaps, as the aviation boys say, we "ain't seen nothing yet."

112648

Oscillating Rods Drive Bike Faster with Less Effort

More speed and more power are developed by an oscillating rod-driven bicycle which the maker claims has faster pickup and is easier to ride than a conventional bike. Long levers transmit foot power by means of oscillating rods connected to the twin chains by special links. The rider sits nineteen inches off the ground.



John William
811 Oaklea

NEW *Knight* RADIOS offer SUPER VALUES

PACKED WITH NEWEST FEATURES AT AMAZINGLY LOW PRICES!

38 MODELS • 5 TO 19 TUBES • AS LOW AS \$8.45

See them in your ALLIED Catalog! 1937 Knights—America's most amazing radios—bring you sensational new developments in radio at a price every one can afford. Features!—new Giant Magna-Span Dials, mighty "Vita-Tone" super-dynamic speakers, perfected metal tubes, Flywheel Tuner, "Electric Eye," Visual Wave-Band Indicator, newly designed beautiful table and console cabinets, etc. Tone quality, sensitivity, selectivity, volume capacity, reserve power, and all-around performance at amazingly low prices that again prove only ALLIED is able to offer such super values. All-Wave, Dual-Wave and Short-Wave—5 to 19 tubes—AC, AC-DC, 6-volt, 32-volt, battery and auto sets—a new 1937 Knight set for every purse and purpose! You'll find them all in your ALLIED Catalog.

THREE
FULL BANDS
WORLD-WIDE
RANGE



8 TUBE AC SUPERHET WITH ELECTRIC EYE

A distinctive new 8-tube All-Wave Superhet that tunes the world! Every new feature yet sensationally low-priced! Electric Eye; three full band coverage from 16 to 555 meters; giant 8" colored easy-to-read airplane dial; flywheel dialing. Newest RCA licensed circuit using latest octal glass tubes. Bass compensation, Automatic Volume Control, Variable Tone Control, full-sized Vita-Tone dynamic speaker—features that bring you a new concept of radio enjoyment. Handsome new "Lay-Down" cabinet. The leading radio value of the season—for full description see page 15 of ALLIED's Free Catalog.

10,000 Radio Parts • Tools • Sound Systems • Amateur Gear

LOWEST PRICES. You need ALLIED's Free Catalog whether you sell, service, or build radios, install P. A. Systems or operate a "ham" station. Besides amazing new Knight Radios, its 152 pages include over 10,000 exact duplicate and replacement radio parts. Test Equipment, latest Public Address Equipment for every Sound need, Amateur Transmitting and Receiving gear, new build-your-own kits, Rurlpower units and Winchargers, etc. We buy in vast quantities, get lower prices, and sell for less. See all these great radio values in the 1937 ALLIED Catalog. Send for your copy now!

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833 W. JACKSON BLVD., CHICAGO



FREE
Catalog



ALLIED RADIO CORP.
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Rush me a Free copy of your 152-page 1937 Catalog showing the 38 new Knight radios and complete Radio Supplies.

Send me Free Parts List for Kit No.

Name.....

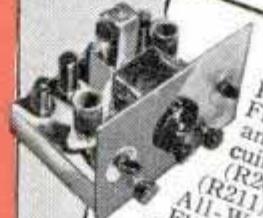
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City..... State.....



6 TUBE SUPPRESSORLESS AUTO RADIO

1937's finest 6 Tube Auto Radio! Completely new in design!—brings you enjoyable noise-free operation without suppressors. Fits any car and matches all dashes. All-electric — operates entirely from car battery. Exclusive features include new dual-purpose metal and glass tubes for actual 9 tube efficiency; 3 gang rubber-cushioned condenser; Automatic Volume Control; full 6 1/2" dynamic speaker. Has illuminated tuner, patented antenna circuit. Complete in ruggedized rust-proof steel case with single-hole mounting feature. Luxurious tone and powerful reception range. See full description on page 148 of ALLIED's Free Catalog.

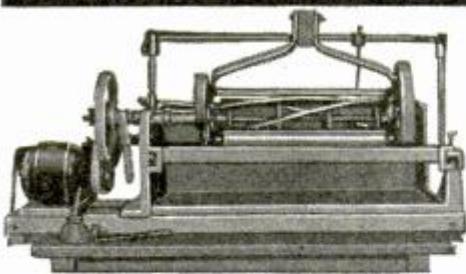


FREE PARTS LISTS

Radio Builders!—Write for Free parts lists covering any Popular Mechanics circuit. 1 Tube Portable (R209); 2 Tube AC-DC (R211); Beginners' 3 Tube All-Wave (R224); 1 Tube Flashlight Cell Set (R227); 150 Watt Transmitter (R231); "A-B" Power Unit for 6 Volt Sets; Beginners' S.W. 2 Tube (R233); "Hurricane" Tube AC-DC (R234); and many others. Crystal Receiver; "Build-Your-Own" Radio" (R234); and many others. ALSO—See pages 125-6-7 of your ALLIED Catalog for dozens of new, low-priced Build-Your-Own kits.

**Allied
Radio
Corp.**

Sharpened over 2,000 lawn mowers last season



"I sharpened between 2,000 and 2,500 lawn mowers this season. I cover a territory of 50 miles around my home town and have all the work I can handle. With the Foley Lawn Mower Sharpener I can handle up to 40 mowers a day."—Ivan G. Long, Penn.

Many other men like Mr. Long are independent and making big money in the fine cash business of sharpening lawn mowers with the

FOLEY Electrakeen

Lawn Mower Sharpener

No experience required. Simply put mower in the machine—the Foley does a perfect job automatically, in 15 or 20 minutes. Sharpens all kinds and sizes by factory method. You get \$1.00 to \$2.00 each for hand mowers and \$4.00 to \$6.00 for power mowers. Investigate NOW!

We also make the
FOLEY
Automatic
SAWFILER

Files hand, band,
circular saws. Saves
eyestrain—does
perfect work. Used by
over 3000 repairshops.

FREE Attachment for grinding axes, hatchets, knives, etc., included FREE. Brings you business the year 'round. Small investment, easy payments. Best season just ahead! Write today for FREE business-getting plans—no obligation, no salesmen will call.

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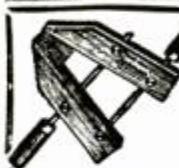
ACE Set



Tools for every operation on metal-cutting lathes \$14.50

Insist on ACE Tool Holders. Drop forged by ARM-STRONG, makers of cutting tools used by 96% in industry. 8 ACE TOOL HOLDERS with Cutters and Wrenches in fitted steel case—Turning, Boring, Knurling, Threading and Cutting off.

Write for Circular
ARMSTRONG BROS. TOOL CO.
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CLAMPS

INDUSTRY will have only dependable clamps, correctly designed and honestly made. That is why industry buys these clamps by name. Be wise. Take only clamps stamped "Jorgensen" or "Pony."

YOUR DEALER OR SEND \$1 AND PAY POSTMAN BALANCE.

ADJUSTABLE CLAMP CO.
"The Clamp Folks"
421 N. Ashland Ave., Chicago,
U. S. A.

Pony No. 50 Fittings go on ordinary $\frac{1}{4}$ " pipe. Makes clamps of any length. Send \$2.00 (new tax price) plus postage (6 lbs.) for Fittings for 2 Pony No. 50 Clamps.

Pony Miniatures
Standard and special types from 12c to 25c each—1" to 2 $\frac{1}{2}$ " cap. Not toys but fine tools with 100 uses.



MARBLE Catalog FREE

MATCHES ALWAYS DRY!

—If you carry a Marble's water-proof match box in your pocket. Absolutely water-proof—holds supply for several days. Made of seamless brass, $\frac{3}{4}$ -inch in diameter. Only 60c at your dealer's, or send postpaid. Get one today. Write for complete FREE Catalog.



Marble Arms & Mfg. Company
578 Delta Av. Gladstone, Mich. U.S.A.

[A5]

5/5/53 Dating Up the American Desert

(Continued from page 380)

insects to serve as carriers in the fertilizing process. But 6,000 years ago, date growers learned how to induce heavy yields by artificial pollination—tying a sprig of the male flower to the female blossom stem. The practice has continued in improved form with resultant preservation of only the choicest male stock. American growers have improved artificial pollination until they now regulate ripening. In regions subject to intense heat, early fall dew, fog or rain, maturity is speeded up by fifteen to forty days, or retarded when a late crop is desired to meet market demands. Pollen from an early ripener and from a retarder have been used effectively on different flowers of a common stem.

As soon as a blossom cluster appears, it is encased in a transparent paper wrapper, which also encloses pollen containers. Fiber or brass triggers, set to regulate the pollen "shot," protrude beneath the edge of the wrappers, so the gardener may manipulate them in accordance with his ripening demands. When fruit starts to mature, the paper wrapper is replaced by a waterproof cloth "overcoat" to protect the cluster from its worst enemy—moisture. A drop of dew may spoil a fifty-pound cluster of ripening dates.

Pollen also influences the size of the crop. Female trees seem to have preferences. One will bear abundantly when pollinated from a certain male tree, while an adjacent sister will curtail output if mated to the same tree. Pollination is done as fast as the flowers open, and the opening process of a single cluster is staggered over eight or ten weeks. The crop ripens in the same manner, and the maturing cluster must be picked over and over. Nor will the unripe mature, like a banana, if the cluster is cut intact from the palm. A green-cut date remains green, and is more astringent than a premature persimmon.

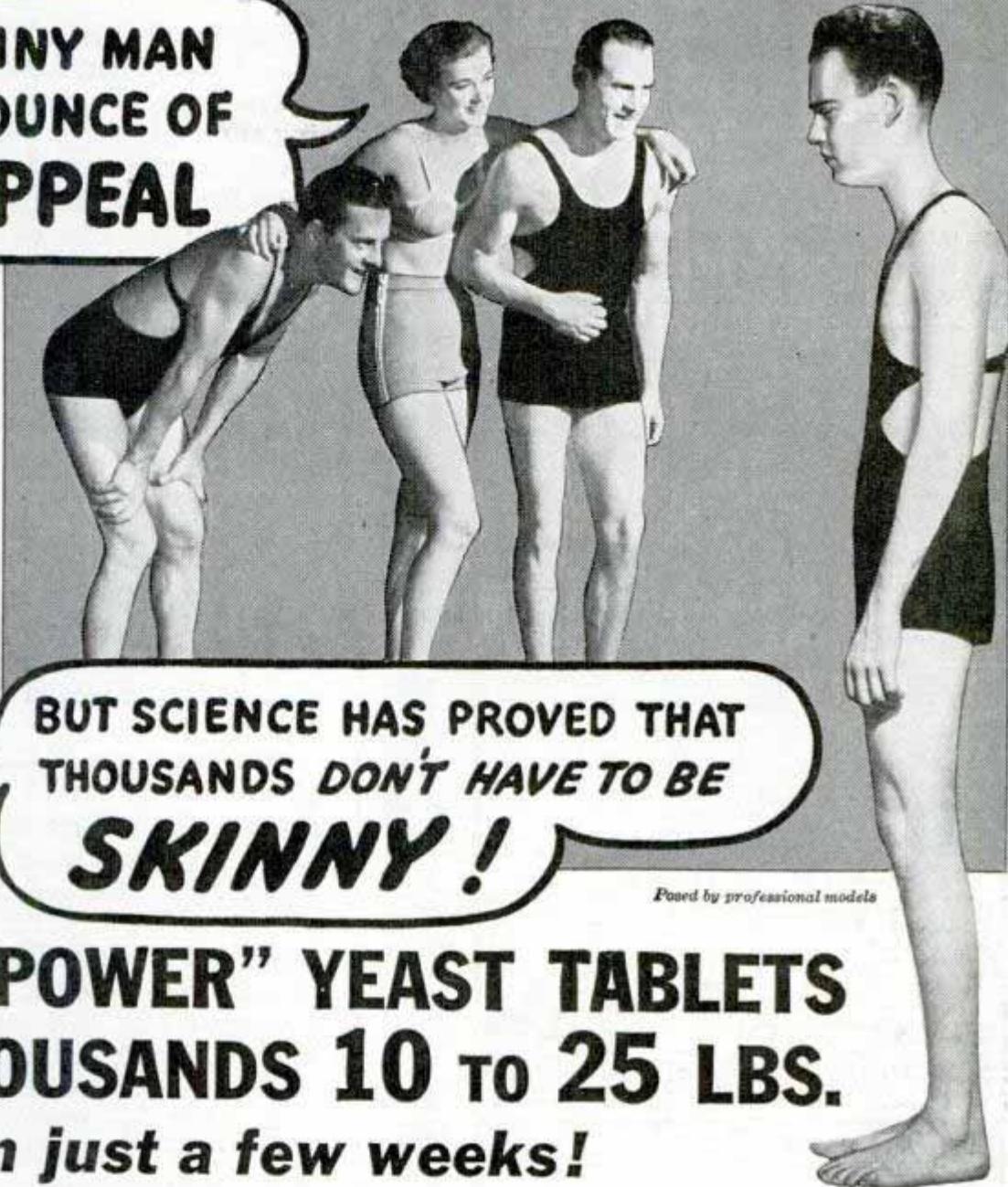
American date pickers work on scaffolds or platforms, which are raised with the growth of the tree, and which are reached by ladders. Old World gleaners climb, using a rope and girdle. The Arab tree-climber has achieved the dignity of a

(Continued to page 136A)

**NO SKINNY MAN
HAS AN OUNCE OF
SEX APPEAL**



**BUT SCIENCE HAS PROVED THAT
THOUSANDS DON'T HAVE TO BE
SKINNY!**



Posed by professional models

NEW "7-POWER" YEAST TABLETS GIVE THOUSANDS 10 TO 25 LBS. *in just a few weeks!*

THOUSANDS of skinny people who never could gain before have quickly put on pounds of solid, naturally attractive flesh with these new "7-power" Ironized Yeast tablets. Not only that, but they've gained naturally clear skin and lovely color, new pep, new friends and popularity—in almost no time!

Scientists recently discovered that hosts of

people are thin and rundown for the single reason that they do not get enough Vitamin B and iron in their daily food. Without these vital elements you may lack appetite, and not get the most body-building good out of what you eat.

Now one of the richest known sources of Vitamin B is cultured ale yeast. By a new process the finest imported cultured ale yeast is now concentrated 7 times, made 7 times more powerful. Then it is combined with 3 kinds of iron, pasteurized whole yeast and other valuable ingredients in pleasant tablets.

If you, too, need these vital elements to aid in building you up, get these new "7-power" Ironized Yeast tablets from your druggist today. Note how quickly they increase your appetite and help you get more benefit from the body-building foods that are so essential. Then, day after day, watch flat chest develop and skinny limbs round out to natural attractiveness. See better color and natural beauty come to your cheeks. Soon you feel like an entirely different person, with new charm and new personality.

Money-back guarantee

No matter how skinny and rundown you may be from lack of enough Vitamin B and iron, try these new Ironized Yeast tablets just a short time, and note the marvelous change. See if they don't aid in building you up in just a few weeks, as they have helped thousands of others. If you are not delighted with the benefits of the very first package, your money will be instantly refunded.

Special FREE offer!

To start thousands building up their health right away, we make this FREE offer. Purchase a package of Ironized Yeast tablets at once, cut out seal on box and mail it to us with a clipping of this paragraph. We will send you a fascinating new book on health, "New Facts About Your Body." Remember, results with very first package—or money refunded. At all druggists. Ironized Yeast Co., Inc., Dept. 533, Atlanta, Ga.



7 REASONS WHY

1. Rich red blood, necessary to nourish and build up the body is promoted where more iron is needed.
2. Hearty appetite to enjoy plenty of good food is assured those who specifically need Vitamin B.
3. Needed aid in getting ALL the good out of your food is supplied where Vitamin B is deficient.
4. Nerves depleted by inadequate Vitamin B, are strengthened by this special nerve-aiding vitamin.
5. Unsightly skin eruptions due to Vitamin B deficiency are corrected and natural beauty restored.
6. Growth, development and increase in weight are promoted where retarded by Vitamin B shortage.
7. New energy, strength and pep are quickly given to thousands who need both Vitamin B and iron.

BIG MONEY

Assembling Mead's New Portable OUTBOARD BOAT!



The OK-2 is strong as a giant.
Yet Weighs only 50 LBS.! Portable.



Priced Low—and PAY as You BUILD!

A sensational! Build this 50-lb. tough, durable, seaworthy, portable Outboard Ki-Yak in 2 days at home! Then it's always ready to go anywhere by hand or car. Safe, leakproof. More speed per horsepower. More miles per gallon!

Mead's perfected aluminum-ribbed, Cut-to-Fit Construction Kit guarantees successful assembly, easily, quickly—and profitably (if you build to sell to others). Amazing LOW Introductory Prices, and if you wish you can even Pay as You Build! RUSH dime and Coupon below, for details!



9 HOURS TO BUILD NEW SPORTSMAN'S BOAT!

For FISHING
CAMPING
HUNTING
SAILING



"CK-2"

Paddle Boat

Quickly Converted Into Speedy Sailboat!

Assemble Mead's "CK" Sportsman's Ki-Yak in 2/3 LESS time with new construction principle. "Home Assembly" saves you nearly HALF factory-built cost! Most sensational boat development in years! Weighs only 30 lbs. Portable by hand or car! Thousands in use! RUSH dime (covering handling, postage) and Coupon for giant new Colored Circular, Low Introductory Prices, \$6.00 Gift Paddle Offer. (Dealers write for Profit Plan!) Hurry!

\$6 PAD-
DLE
GIVEN

with your Ki-Yak
if you hurry!



MAIL COUPON RIGHT NOW!

Gentlemen: I am enclosing 10c postage, handling charge. Please rush me your New Boat Catalog, Low Introductory Prices and \$6 Gift Paddle Offer.

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STREET & NO.

CITY..... STATE.....

RUSH ME WITH 10c TO:

MEAD GLIDERS 15 So. Market, CHICAGO

Dept. B-37

1663 (Continued from page 134A)

profession, but hasn't improved his methods or equipment for centuries.

Transplanted palms are irrigated morning and night for the first forty days; once a day for the next forty days; every two days for the rest of the year, and every week for the rest of their lives. Where surface water is not deeper than fifteen feet a palm will struggle along without intensive irrigation; but the yield will be lighter. Offshoots from thirsty trees are better producers and more hardy. An outlay of \$4,000 to \$6,000 is required to bring an acre of dates into bearing. But once in full production, the American palm averages 200 pounds a year, or 100 per cent more than the Old World average. Exceptional trees have produced 500 pounds. No other commercially grown crop yields such a quantity of human food over so long a period without seasonal reverses.

America paid \$4,350,000 for 53,181,000 pounds of imported dates in 1935, and grew 6,506,000 pounds in the same year. That was an increase in home production of 9,000 per cent over 1926, when the first American commercial crop of 70,000 pounds was sold. The gain in producing acreage for the same period was only 100 per cent. The 1936 crop, being harvested as this is written, is estimated at 4,000 tons.

Most of our date imports are shipped from near the junction of the Tigris and Euphrates rivers. They are brought from oases in brown goat-hair bags strapped to camels, just as they have been transported since earliest antiquity. An oasis grower depends upon by-products of the palm and crops grown beneath his trees to keep out of the red. The palm supplies him with fiber for rope, cane for baskets, fuel from the stripped limbs and roof thatch and building material from the palm leaves. His bread is a paste of sirupy dates, and his wine and his sugar are distilled from the sap of toddy palms. The entire tree is a potential source of pulp for manufacture of the finest writing paper.

Date palms are undamaged by temperatures of twelve above zero. No one knows how much heat they can stand. Offshoots selected for planting in pest-free zones of America are baked in a temperature that destroys insect life and eggs,

(Continued to page 138A)

LET THE ENGINEERED FEATURES DETERMINE YOUR CHOICE

Tools must be engineered to give service. That in itself is sufficient reason for your selecting these 1937 Driver Power Tools. Every new development is preceded by careful study and expert planning to make Driver Power Tools the outstanding values in home workshop equipment—they are Engineered Tools.

Stop in at your nearest Driver dealer's to-day and convince yourself of their high quality and fine appearance. Or send for a copy of the colorful 1937 folder which illustrates and describes every Driver Engineered Tool in detail.



DRIVER BN725 BAND SAW

\$31.50 as shown, including 72-page Instruction Book. Craftsmen who examine this 12" Band Saw wonder how it is possible to sell so much quality for so little money. Guards, ripping guide and table extension are regular equipment. SKF ball bearings throughout. Geared control mechanism for tilting table. Shipping weight 103 lbs. Does all work easily, quickly and smoothly.

Driver Engineered Power Tools include Band Saws, Jig Saws, Bench Saws, Jointers, Motor Grinders, Flexible Shafts—Three Complete Lines in Three Price Ranges.

ASK YOUR DEALER ABOUT THE DRIVER EASY PAYMENT PLAN

DRIVER Engineered POWER TOOLS

ENGINES



Enclosed, Self-Oiling, Roller Bearing

A reliable engine, using all fuels, for farm or factory. Cheapest power for pumping, sawing, separating or similar work. The best engine for the money. Put one to work and watch it pay for itself. Sold Direct From Factory to YOU. Immediate Delivery. Write today.

WITTE ENGINE WORKS
4743 Oakland Ave., KANSAS CITY, MO.

POPULAR MECHANICS FAMILY TRAILER PARTS

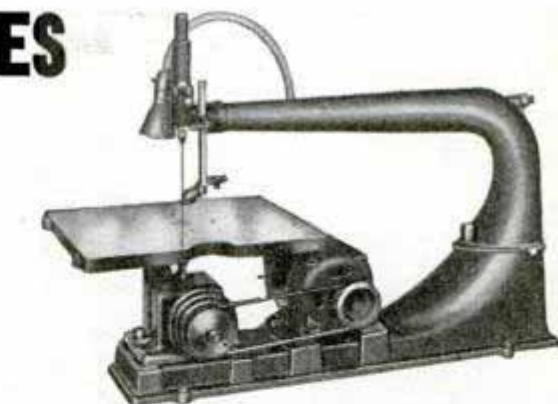
Available from Hammerblow Tool Company—the original.

Don't build until you get Hammerblow facts. Save money, time, wasted labor, Hammerblow guarantees a rugged, non-sway, perfect trailer! **BLUEPRINTS FREE WITH PARTS.** Hammerblow parts are world's best. Used by nationally known firms, and engineers who know. Send only 50c for 64-page Trailer Builder's Guide and Free 40 page supplement. Immense value. Or write for Free Literature. **HAMMERBLOW TOOL COMPANY, Dept. 103, Wausau, Wis.**

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Adds, subtracts, divides, multiplies as accurately as \$100 machines. Weighs only 4 ounces. Not a toy—strong guarantee. Absolutely accurate, lightning fast. Sells on sight to offices, stores, homes—all who use figures. Write quick for **FREE AGENTS** sample offer and Money-Making Plan.

C. M. Cleary, Dept. 63, 303 W. Monroe St., Chicago



DRIVER J740 JIG OR SCROLL SAW

\$26.95 (as shown less Motor and Saw Blade) including Flexo Lamp, Belt, Motor Pulley, Two 3-way Electric Outlets and 72-page Instruction Book.

In this streamlined 24" Jig Saw still higher standards of utility, efficiency and value are reached. Throat capacity 24". 16" x 12 1/2" machined table tilts to 45° angle—has graduated quadrant. Positive blower in head. Splash oiling. Ground surfaces on arm and head assure easy action and positive alignment. Shipping weight, less motor, 115 lbs.

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Name _____

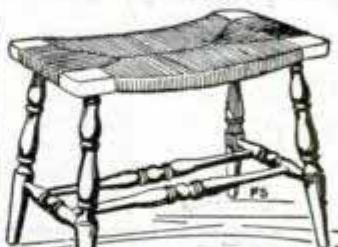
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AMATEUR CARTOONISTS WIN \$25.00

Wanted—Amateurs with humorous ideas. No drawing ability necessary. The amateurs of today are the professional cartoonists of tomorrow. Ideas judged and prizes awarded by Applause-O-Meter test before movie audiences. Everyone has an equal chance. 26 cash prizes in all. Rush name on penny post card for "Valuable Tips on How to Make Money With Simple Cartoons and Humorous Ideas." Cash Prize Entry Blank and Rules—SEND NO MONEY.

CARTOONISTS' EXCHANGE
Dept. 93-B, Pleasant Hill, Ohio

Learn to Re-Seat Your Chairs

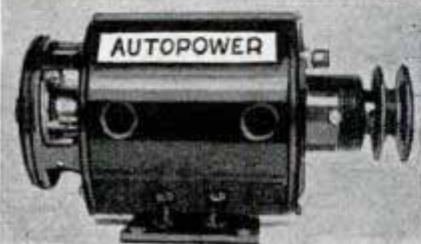


The H. H. PERKINS CO., 252 Shelton Av., New Haven, Conn.

Have you a chair, stool or bench that you would like to re-seat? We will teach you how to do it. Use either Cane, Rush, Reed, Splints, Fibre Rush, Cane Webbing or Grass.

Instruction Book Only 10c

Send 10c today for our illustrated Instruction Book and price list explaining how to do Seat Weaving.

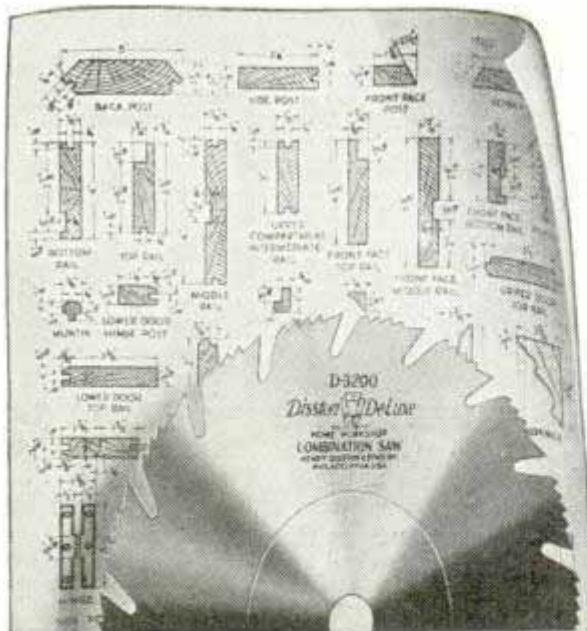


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AUTOPOWER tells you how in plain, easy, simple, and illustrated instructions that anyone can follow. Change auto generators into useful, practical A C and D C generators and motors with voltage from 2 to 1,000 volts, for power, light, welding, radio, sound, etc. No previous experience nor special tools needed. Generators can be driven by wind, water, fan belt, etc. Already used and endorsed by thousands. Send today for your copy, and also receive FREE a copy of PRACTICAL ELECTRICAL, the new publication for the man who wants to KNOW, BUILD, REPAIR, and READ about electrical apparatus and machinery. Book and magazine postpaid only \$1.00.

410 S. Hoyne Ave., Chicago





Fine Work Begins with a Disston Saw

New! The Disston DeLuxe is the finest home workshop saw you can buy. Disston steel! Disston workmanship, of the highest standard! On any job you do, Disston DeLuxe means easier cutting. On something that is a real challenge to craftsmanship, you will realize that the easy, accurate cutting of this fine blade is the beginning of fine work.

Ask your dealer for this saw by name: "Disston DeLuxe", etched on the blade. See the high, smooth finish... accurate fitting... keen teeth, that hold their cutting edge. Ownership of a Disston DeLuxe Saw is of itself inspiration to build pieces of which you can be proud.

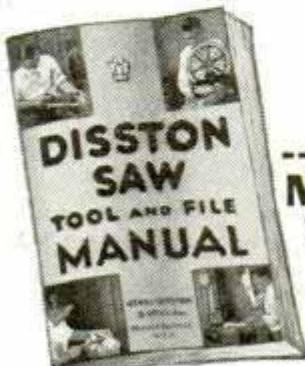
Cross-Cut — Rip — Combination

6" (1/2" hole) \$2.40	8" (1/2", 5/8", 3/4" hole) \$3.20
7" (1/2" hole) \$2.80	10" (5/8", 3/4" hole) . . . \$4.05*

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Use Disston Saws, Tools, Files



in your home workshop. How to choose, use, care for, these better tools and do better work — all is shown in this Disston Manual sent FREE.

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& SONS, INC.
311 Tacony
Philadelphia, U. S. A.

Your name.....

Address.....

163 (Continued from page 136A)

yet seldom injures the plant. Growing trees, too, are subjected to fire to kill pests that hide in fiber between the base of the leaf stem and the tree trunk. The fiber is nature's pad to protect palms from injury by threshing stems in frequent desert storms.

No one can predict how far the United States will go with its dates. Irrigation projects connected with Boulder dam will open up and water thousands of square miles of potential date land. Encouraging experiments are being made with production under climatic conditions hitherto believed impossible. They prove palms will thrive away from Sahara sun and soil. It is too early to forecast date gardens north of the arctic circle, but it is quite safe to predict elimination of an annual import item of more than \$4,000,000. For, as time is reckoned in horticultural progress, it was only yesterday that America started to date up old Dame Desert.

1634 Ski Elevator on Mountainside Gives Sportsman a Lift

It takes no time at all to ski down a mountainside, but climbing back up is another thing. At St. Moritz, Switzerland, the round trip is no effort, for a "ski elevator" hauls the winter enthusiasts back up to the 8,000-foot level in a few minutes.



Skier makes the grade up a Swiss mountainside sitting down, an elevator "trolley" doing the work

ALL PURPOSE MOTO-TOOL



10 DAY MONEY BACK TRIAL

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Grinds, drills, engraves, routes, carves, sharpens, polishes and does hundreds of jobs quicker, better and with greater precision. Handles easily as a pencil—weighs only six ounces, and is **amazingly powerful**. 110-Volt Universal Motor—about 20,000 r.p.m.—oilless, self-aligning ball thrust bearings. Handy built-in switch. Easily replaceable brushes. Universal Collet Chuck. Bakelite housing. You must see and use it to appreciate its tremendous value.

Order on 10-day trial. Money refunded if not more than satisfied. Booklet Free. 20-piece Craftsman Tool Set for all types of Moto-Tool work, \$5.75.

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Heavier, tougher **pure** zinc galvanizing. Stronger, tougher Copper-Bearing Steel. **Same low Factory Prices.** WE PAY FREIGHT. 100 styles and heights Farm, Poultry and Lawn Fence; Steel Posts, Gates, Barb Wire, Paints, Roofing. Write today.

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Muncie, Indiana
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RE-STRING RACKETS AT HOME • EARN MONEY •



It's easy, pleasant, profitable work. No experience required. Learn in a FEW MINUTES. I supply everything needed. Earn \$50 to \$100 cash in your spare time. Act QUICK—write for details FREE.

SPECIAL
Set Permatex Silk Strings, 50c |
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29-Pc. Electrical Experiment Kit



Wire up thief detector, extension phone, elec. welder, radio code set, electro-plating, arc furnace, circuit tester, rectifier, etc. Build air light, 4,000-ft. range, secret service phone (listen in private conversations), generate health rays, make electric stove, etc. Kit contains 110-volt A. C. power motor, microphone, transformer, 26 other pieces commercial apparatus. Original cost \$18.50. Now \$3.99. 6 Books with kit. Elec. Short Course, Fun with Elec., Electric Arc Manual, Radio Short Course, Motor-Transformer Manual, Exper. Lab. Plans. **ORDER NOW!**

5¢ stamp brings Electrical-Radio-and-Tool bargain catalog.

ELECTRICAL SALVAGE CO., Box 524-A26, Lincoln, Neb.

NEW Light Weight Paint Sprayer—Only \$29.50

1/4 H.P. Motor AC110 Volts. 60 Cycles. COMPLETE Quick, easy way to paint screens, furniture, radiators, machinery—anything—in homes, Factories, Stores, Schools, Hospitals, Office Buildings, etc. Small, compact. Carry anywhere. Weight 44 lbs. Complete with Spray Gun, 15 ft. Hose. **FULLY GUARANTEED.** Only \$29.50 f.o.b. Chicago. \$5.00 Deposit, Balance C. O. D., or see your dealer. Free Circular, Ideal Pump Co., Dept. P-3, 801 Washington St., Chicago, Ill.

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—like J. R. Sammons of Billings, Mont. Started a Fyr-Fyter Dealership in his home a few years ago. MADE PROFITS OVER \$6,900 IN 1935. Business in 1936 will exceed 1935 record. Inspect, Service and Refill all types of Approved Fire Extinguishers. Previous experience unnecessary. We train and advance you to Dealership for complete line of Fyr-Fyter Extinguishers. Schools, stores, homes, auto and truck owners, farmers, warehouses, churches, factories, filling stations, public utilities, etc., are your prospects. Use your home as headquarters. No stock investment required. Real opportunity for men past middle age as well as younger men. Write a letter giving full information about yourself and past work to **THE FYR-FYTER COMPANY, Dept. 90-15, DAYTON, OHIO**

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Do Electric Welding ... New big-profit jobs ... low investment ... pay as you earn ... with the Guaranteed FlexArc.

Do as hundreds of other shops are doing. Cash in on the new profits of the Welding Age! Be welding headquarters for your community. But, plan wisely. Get a full-range, high-capacity welder that will do all kinds of work. Common-sense says your best guide in picking a machine is the advice of operators who have used all makes. Here's what they said about the New FlexArc in a recent nation-wide poll: 89% said it welds FASTER; 91% said BETTER; 74% said it EARNS MORE MONEY; 96% liked its SAFETY!

It's the only d.c. welder sold with a written guarantee. Backed by Westinghouse, 50-year veteran electrical pioneer.

Build Your Own—With a second-hand auto engine and chassis, all you need is the FlexArc generator. Save \$300 to \$500.

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Easy to Buy—Easy installments. No red tape. Pay out of monthly profits. Act now while offer lasts. Mail coupon.

Westinghouse Electric, Room 5N2, East Pittsburgh, Pa. Without obligation, send your new "1937 Catalog of Popular FlexArc Models." I am especially interested in:

Building my own Electric Driven Gas Engine Driven 30-Day Trial Easy Payment Plan.

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FASTEST SELLING WELDER ON THE MARKET TODAY

SENSATIONAL NEW Auto-Glide \$125

WORLD'S CHEAPEST MOTOR TRANSPORTATION



NEWEST RIDE THRILL!

Sweeping the nation! 30 miles per hour! 100 miles on a gallon of gas! Almost as comfortable and convenient as an auto—at 1/10th the operating cost. Safe. Wonderful for pleasure, school, deliveries, business. Saves walking, saves time. Easy to ride, easy to park.

One of World's Greatest Engines!

Low cost, unfailing, genuine Cushman Husky 4-cycle engine. 12" x 3 1/2" balloon air tires. Channel steel frame. Double steering head. Drum brake. Clutch. Hand throttle. Large cushioned seat. Beautifully finished.

FREE Send for booklet, photos, complete details. **WRITE TODAY!**

THE CUSHMAN MOTOR WORKS, Dept. 38, Lincoln, Nebr.

DEALERS

Someone in your town will soon be selling Auto-Glides. Why not YOU? Write for Special Offer!

CHAS. AMMON, Pres.

KILL RATS WITHOUT POISON



This proven exterminator won't kill Livestock, Pets or Poultry—Gets Rats Every Time. K-R-O is made from Red Squill, a raticide recommended by U.S. Dept. Agr. (Bul. 1533). Ready-Mixed, 35¢ and \$1.00; Powder, 75¢. All Druggists. Results or Your Money Back. K-R-O Company, Springfield, O.

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AT LAST! The famous Remington NOISELESS Portable is yours for only ten cents a day. Brand new. Not rebuilt. Standard keyboard and every modern feature. Free carrying case and typing course. 10-Day free trial. You don't risk a penny. WE PAY ALL SHIPPING CHARGES. Act now! Write Remington Rand Inc., Dept. 152-3,315 Fourth Ave., New York, N.Y.



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Get this big outfit for metal tapping. Make artistic Book-ends, Desk Racks, What-Not Racks and Plaques. Equipment includes plywood, special non-tarnishable metals, tapping hammer, 2 tapping tools, supply of nails, and design patterns, packed in attractive carton. See your dealer or send \$2.00 for complete outfit making Pair of Bookends, What-Not Rack and large Twin Plaques. State choice of Copper or Brass, "Gold" or "Silver" \$2.50. **FREE CATALOG**

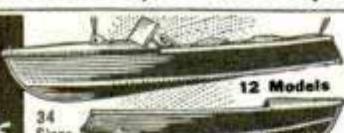
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non-sinkable

BOATS

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523 to \$155

America's outstanding values in Row Boats, Fishing, Hunting, Outboard Motor and Sail Boats. Will not sink! Low Cost! No work, worry or upkeep cost! Always ready to use! Preferred by leading summer camps and resorts! Send post card for 24-page catalog! It's Free!

GAS MOTORS Ready-to-Run

FREE — finished, mounted fly-wheel with every motor!

Never in the history of gas engines was a motor ever offered at so low a price. All America has acclaimed this engineering triumph—accomplished by outstanding G.H.Q. designers and engineers after years of exhaustive, scientific, aerodynamic research. Has a broken records for amazing performance. Flies model planes up to 10 ft. wingspread. Also used for boats. And look at all these extra features! Easy starting—just a twist of the wrist. Steady running—runs 27 minutes on ounce of gas. Precision, replaceable parts. Cylinder and Piston Lapped. Longest crank shaft ever made on miniature motor. Chrome nickel steel shaft with $1\frac{1}{8}$ " bearing surface. Connecting rod of high speed bronze. 1/5 horse power at 300 to 8000 R.P.M. This famous motor complete, entirely assembled on a stand. Tested and run before shipment—performance guaranteed. No oil, gas or batteries included. Only \$12.50. Send 3c for illustrated catalogue.

\$12.50

G. H. Q. MODEL AIRPLANE CO.

854-B East 149th St.

New York, N.Y.

The Thrill Hunters

(Continued from page 351)

auto roll. He has cracked up several hundred cars and has been in the hospital twenty-two times as a result of some of his stunts which include driving a car through a flaming fence, rolling a car over at sixty miles an hour, jumping a car over a truck and crashing head on into another car. Teter went to automobile races but paid more attention to the crowds than to the cars. He saw that they were morbidly interested in accidents.

"Here," he decided, "is a show to which more people can be attracted, if you can guarantee there will be some accidents."

So he determined to go into the business of providing intentional accidents and thrills. He began by experimenting with a car, driving two wheels up an inclined ramp until the car would roll over. He practiced this until he could get it to roll over while driving at high speed. The first time he tried the stunt before an audience it rolled over twice and the awestruck crowd thought he had been killed. He crawled out and said disappointedly: "I hoped to make it roll over three times."

But even the careful inspection he makes before each stunt is no proof there will not be some unforeseen accident. Last season he made the longest jump in a sedan over a truck that he had ever attempted, moving the truck away from the ramp until the far edge was thirty-four feet away. But he didn't land right. The hose connection tore loose from the radiator of the car and scalded him with hot water.

Most high divers become thrill providers deliberately, too. Among the leading performers are Sol Solomon, Frank Cushing, Kenneth Blake and Arthur Holden. Holden, who has been high diving for nearly forty-five years says he became one because "it's an easy way to make a living." Even the high divers are constantly adding new thrills to their acts. Cushing, for example, has added glass crashing. Blake, called the "Human Skyrocket," now dives ninety feet into a shallow tank of water which extinguishes the flames of his gasoline soaked coat which he ignites before he jumps.

Some thrill providers enter their profession by chance. As routine performers

(Continued to page 142A)

NEW 14-in BAND SAW



The previous Delta 14-inch Band Saw was a revolutionary new tool in its field. Now, Delta offers a new 14-inch Band Saw with still further improvements and refinements making it still more convenient, more rigid and safer to use. In this new model, both wheels are completely enclosed. Controls for the lower guide adjustments are brought out to the front of the table, so that the operator can make the final adjustments while the machine is running without having his hands anywhere near the blade. There are new heavy duty trunnions spaced far apart to give utmost rigidity to the table (a patented feature). For the full details see the 1937 Delta Catalog.

New Tools—New Improvements in 1937 DELTA LINE . . .

This year Delta offers many new tools and features of interest including:

A remarkable NEW Belt Sander; Revolutionary NEW 17" Drill Presses; a NEW Precision 4" Jointer; a NEW Precision 11" Drill Press; Improved 14" Drill Presses; Improved Combination Units; NEW Tapping Attachments; NEW Shaper Cutter-head; NEW Tenoning Collars; NEW Belt-Drive Buffer; NEW Belt Guards and Improved Safety Features.

Send for 1937 CATALOG!

And also the New 32-page book No. 3 of "Practical Delta Projects" crowded with new and "out of the ordinary" things to make—with many photographs, working drawings, and easy-to-understand illustrations. Every craftsman should have this book. Send 10c with coupon for Delta Project Book No. 3. 1937 Delta Catalog mailed postpaid.

DELTA MFG. CO.

600-634 E. Vienna Avenue
Milwaukee, Wisconsin

DELTA MANUFACTURING CO. Dept. A337
600-634 E. Vienna Ave., Milwaukee, Wis.

I enclose 10c (stamps or coin) for which please send me one copy of the new 1937 Book No. 3 of "Practical Delta Projects." Also place me on your mailing list to receive 1937 Delta catalog of quality motor-driven tools. I am interested in Delta Tools for:

Home Shop Industrial Use School Shop

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Address _____

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Check here if you are a Delta user now.

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Most efficient metal and mineral ore locator ever known. Absolutely guaranteed to detect buried GOLD, SILVER, or any other metal. Extremely powerful new models; very simple to operate; light in weight. Put your prospecting on a scientific basis. If you know of buried treasure, find it with the new Goldak. Write world's largest manufacturer of successful mineral locators for interesting information.

THE GOLDAK CO., Dept. P
1031 South Broadway, Los Angeles, Calif.

KNEE ACTION TRAILER AXLES

Knee action, drop center, & straight axles available in 56", 62", 68" & 72" treads, detailed circular upon request.
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Box 4, Strathmoor Sta., Detroit, Mich.

RAISE GIANT FROGS

NUFOND GIANTS WEIGH
UP TO 3 LBS. EACH



SELL UP TO \$5 PER DOZEN!

A New Industry! Millions used yearly! Markets waiting. Prices Steady. Pleasant, outdoor work. Easy to ship to any part of the country. Nation-wide market at your command.

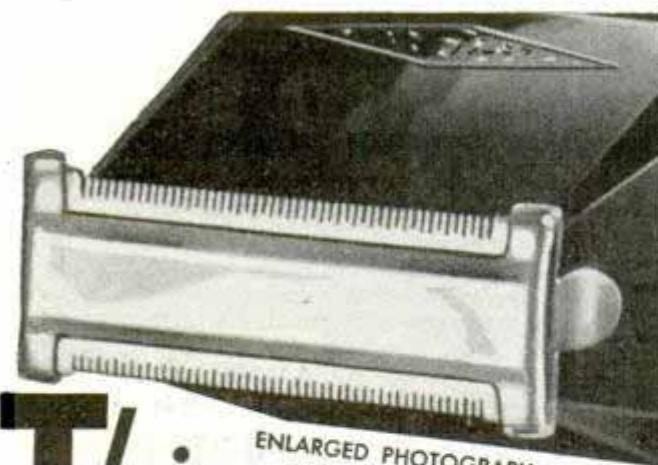
A SMALL POND is all you need to start with five pairs of "Nufond Giant Breeders." Expand with the increase. WE BUY! As originators of *Canned Frog Legs*, we are developing one of the world's largest frog markets. In addition to other markets, frog raisers can also ship to us.

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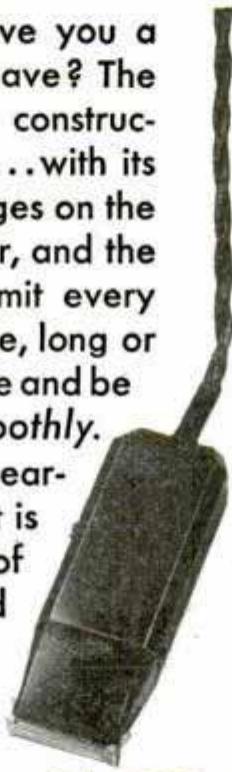


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T 159
(Continued from page 140A)

they find that they have plenty of nerve and gradually apply it to make more money. In Hollywood, a few years ago, four girls were despondent because they could not get jobs in the movies. A manager suggested jokingly that acrobats made money. The girls took him seriously and developed an "iron-jawed" act in which they were whirled through the air hanging to straps by their teeth. As they developed confidence, they decided the difference between doing their act twenty feet in the air and 120 feet was only one of nerve. Financially, however, it meant a difference of a great many dollars. Today they are doing their thrill act from the top of two ladders 120 feet high.

There is another type of thrill merchant of the "bridge-jumper" type of whom the entire thrill profession is wary. This is the desperate young man or woman who is inexperienced but who offers to do the impossible in the hope of getting much needed money. They are not given the slightest encouragement.

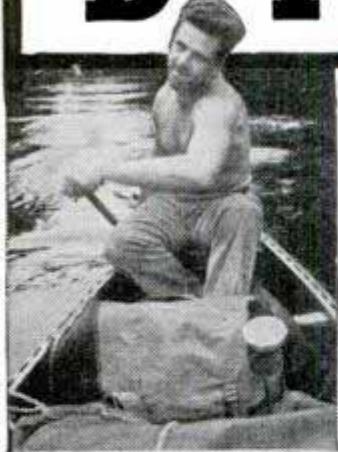
"It takes more than sheer courage to become a daredevil," states Mr. Hamid. "It takes plenty of practice and hard work and there is always present the danger of over-confidence."

Mr. Hamid says the number of American-born daredevils is increasing. One reason for this is that fewer European performers are coming to this country because they today command good salaries abroad. Another reason is that the crowds now prefer the American-type thrills of diving and crashing. When a new daredevil appears on the horizon, he is not left long without work if he can really thrill the crowd. Each year new attractions are needed. For 1937 Mr. Hamid expects to import three or four dozen new foreign thrill merchants and add about seventy-five American daredevils to the thrill circuit. Throughout the world scouts are actively hunting for new stunt sensations which will thrill American audiences.

"Americans like their thrills," states Mr. Hamid. "They want them fast, furious and sensational and they're willing to pay more for them than ever before."

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X1511 Snow Fighters Clear the Way

(Continued from page 357)

only to look back and see the banks crumble and the shifty snow fill the new cut level under the lash of a sub-zero wind. It took one plow eighteen hours to open a lane through a snowbank twenty-five feet deep and 800 feet long near Lawler, Ia. Eighteen-foot drifts trapped a passenger train near Jackson, Wis., and then caught fast the special train sent to its rescue. A crew of 100 men with shovels was sent to dig a path to town a mile away for the eighty-nine marooned passengers. Plows finally extricated the trains, but to keep the lines clear workmen had to terrace the sides of the cuts, sometimes passing up buckets of snow by hand. When a coal train with one cattle car was snowbound in Illinois the crew tramped to town in twenty-eight below zero weather and obtained tar paper to wall the car and protect the livestock. Signal lines along the ground must be dug clear, and switches must be thawed. Failure to remove all the snow from one switch last winter caused the derailment of a freight train and blocked the line for hours.

In the cities it is not merely a problem of opening lanes for automobiles and street cars and pedestrians, but the snow must be removed entirely. Sewers must be kept open, fire hydrants cleared. Streetcars, buses and municipal trucks equipped with rotary brushes and drags shove the snow toward the curb, but this only builds up a wall along the side of the street.

Tractor plows and mechanical loaders today are taking the places of the shovel brigades. Wedge plows and drags start out when the storm begins. Propelled by heavy-duty motor trucks, they push the snow aside and keep the center of the street clear for vehicles. Meanwhile small tractor plows patrol the sidewalks, adding to the pile along the curb.

As the huge bank accumulates on the curb, automatic snow loaders go into action. Rotating, tooth-edged disks cut six-foot swath in the heaps flanking the street, feed the snow to a conveyor which carries it up to be funneled into a conveyor truck. These loaders methodically eat up great ridges of snow and ice, dumping ten cubic yards to fill an oversized truck in fifteen to thirty seconds.

What to do with a few hundred thousand cubic yards of snow is still another problem. If you live on a river, a lake or an ocean the answer is simple enough. Some cities use vacant lots or sewers for snow dumps, which is not always satisfactory, for there is the danger of clogging the sewer, and the spring run-off to consider. In old Quebec, snow collected in "upper town" is dumped over the edge of the cliff into tremendous heaps that are still melting when summer tourists come.

A novel method of ridding itself of snow was evolved at Westmount, a Montreal suburb. The snow is given a bath at the public incinerator. Until recently the Westmount garbage disposal plant developed a large portion of the city's electricity, and huge cooling basins were built to handle the flow of hot water from the turbines. Part of these basins has now been partitioned off and filled with hot water from the incinerator; solid buffers have been placed along the edge of the pool and the trucks, loaded with snow, back up to the pool and tip over their cargo. In short order the snow is turned to slush and then sluiced into the city sewers. In nine weeks of heavy snows the city disposed of 209,000 cubic yards in this giant melting pot.

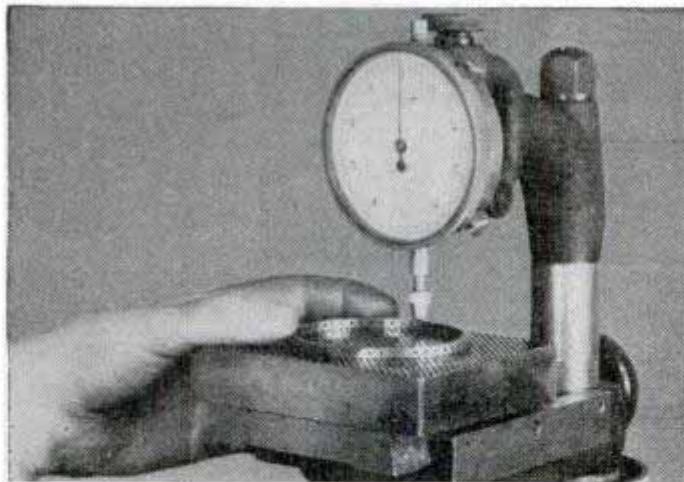
Thousands of dollars may be invested in elaborate street-cleaning equipment, yet if the winter's snow is not put safely out of the way the coming of spring may bring more thousands of dollars' loss in flooded buildings and damaged sewers and pavements.

X165 Ship's Propeller Worn Away by Friction of Water

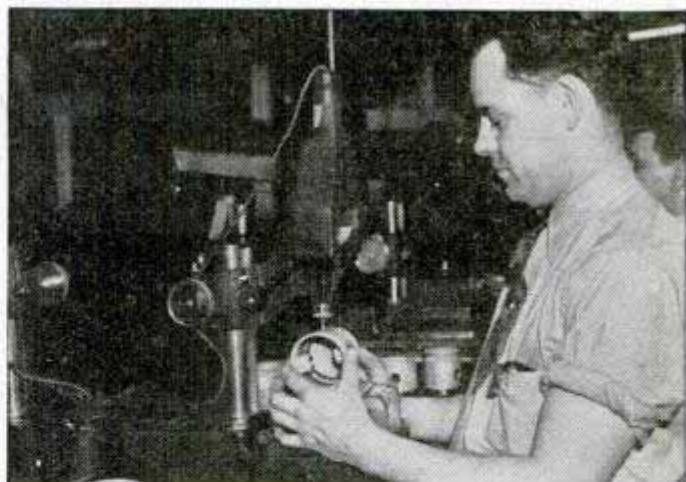
In service only five years, one blade on the starboard propeller of a Panama-Pacific liner was found to have been reduced in weight two hundred pounds by water friction when it was removed recently. A new blade was installed, but it had to be made especially because its weight could not be different from the one which it replaced.

Our Bureau of Information will answer questions regarding articles in this magazine, if accompanied by return postage.

Checking piston-ring widths on extremely accurate dial gage.



Inspecting Ford Pistons for accurate diameter and roundness on quick-reading amplifying type of gage.



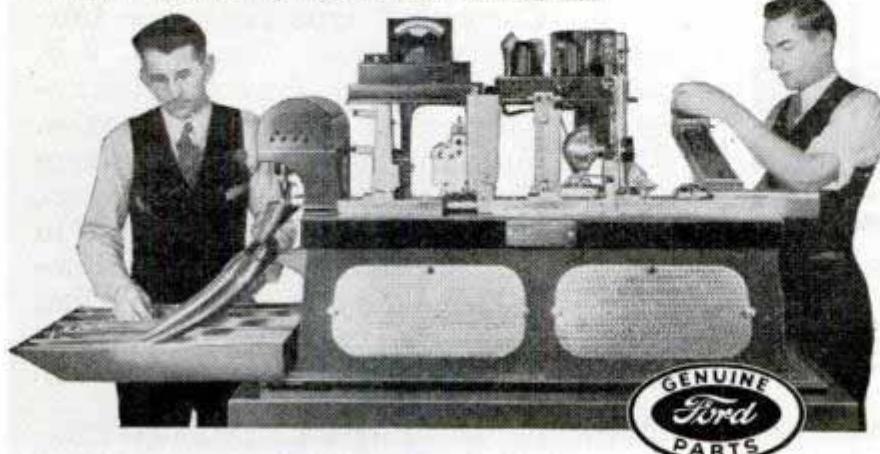
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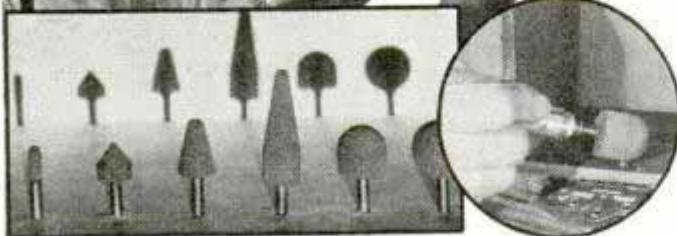
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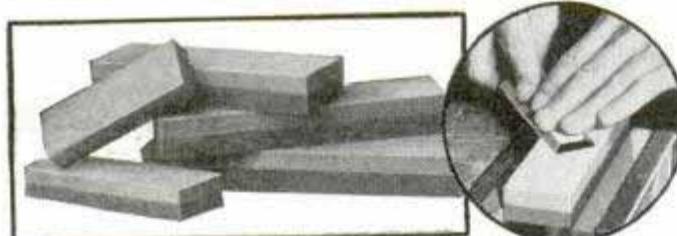
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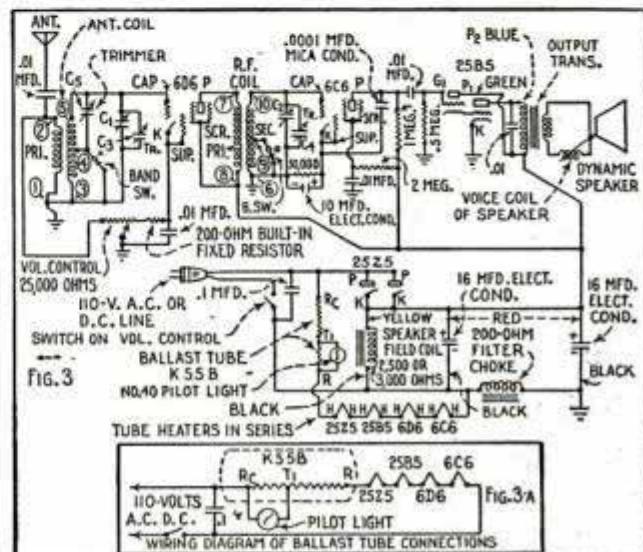
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Little Giant Portable Receiver

(Continued from page 419)

The new "Triad" 25B5 "triple twin" output tube delivers twice the volume of the type-43 formerly used in this simple t.r.f. circuit. Tuning from 550 down to 70 meters, it now includes two of the amateur bands and all police broadcasts. All diagrams are simplified so that anyone who can use a soldering iron should be able to build the set. It is housed in a modern "lay-down" type of cabinet which is eas-



ily portable for tourists, summer homes and individual room use.

The chassis dimensions are given in Fig. 1 for those who wish to make their own; however, this metal base is available from several radio supply houses, formed and drilled. These ready-made bases are cadmium-plated for easier soldering.

A simplified wiring diagram, showing all connections below and above the base, appears in Fig. 2; the schematic circuit diagram is given in Fig. 3. The diagram Fig. 3-A merely repeats the main connections to the "Champion" type resistance tube K55B for convenience. Figs. 2-A, 2-B, 2-C, 2-D and 2-E show the completed receiver photographed from various angles.

When mounting the sockets on the base arrange them so that the heater prongs, indicated by the large black dots, are in the positions shown in Fig. 2 when viewing the base from the underside. Note that an octal-type socket is used for the ballast tube. The RCA 25Z5, 6C6 and 6D6 tubes are all standard glass types.

Although the drilled base and all parts

(Continued to page 148A)

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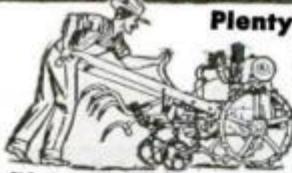
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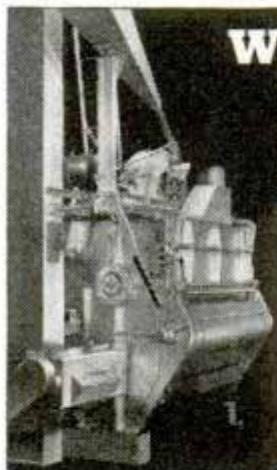
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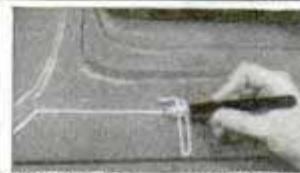
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(Continued from page 146A)

cost only about \$8.50, less tubes and cabinet, they must be as specified for maximum results. The cabinet includes the dial and is available for about \$2.50. An original list of all parts used can be ob-

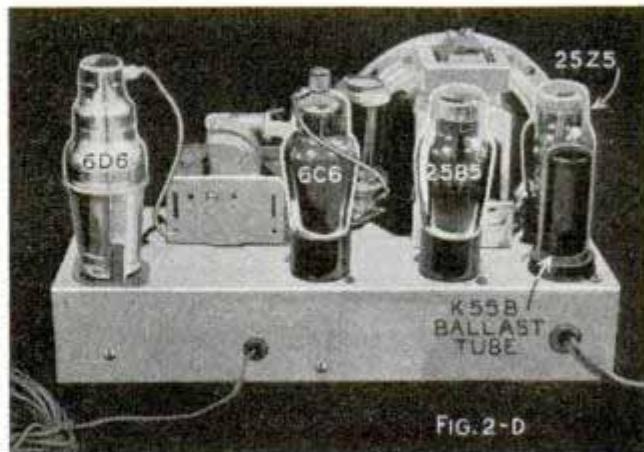


FIG. 2-D

tained upon application to Popular Mechanics radio department without charge.

It is important that the filter choke should not have more than 200 ohms d.c. resistance or the plate voltage to the 25B5 tube will be materially reduced. This also applies to the speaker output transformer. The primary should not exceed 200 ohms d.c. resistance and the plate load should be 2,000 ohms for best results; ordinary a.c.-d.c. set speakers with 43 or 38-tube output transformer will not work. To line up the receiver, tune in some station at about 1,400 k.c.; tune slightly off this sta-

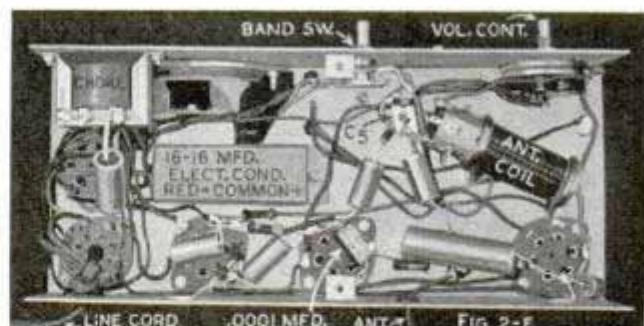
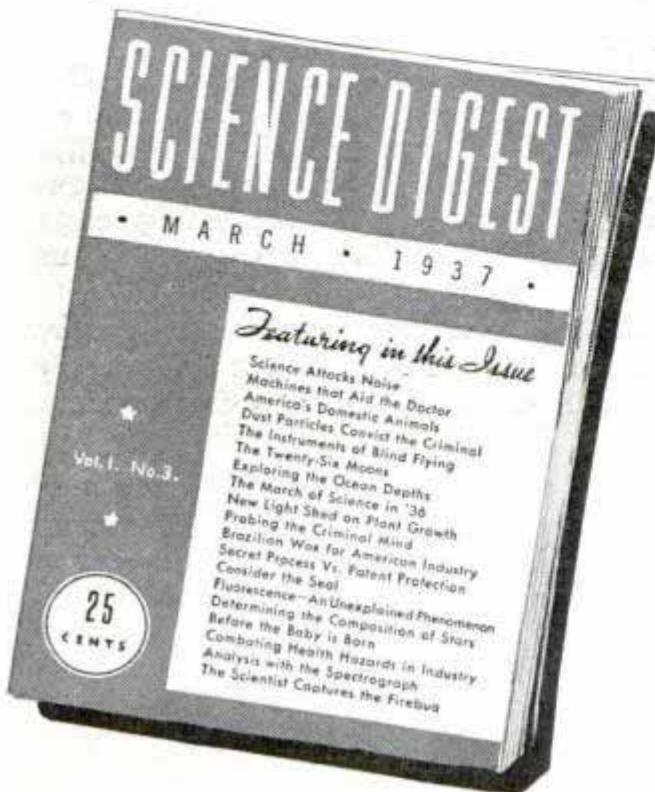


FIG. 2-E

tion and adjust trimmers (Tr.) C-3 and C-4 with a small screwdriver, to maximum noise. Next turn the band switch to the left (short-wave position) and set the 2-gang condenser so that the rotor plates will be $\frac{3}{4}$ out; now adjust (C₅) to maximum noise and the set is in balance. A 20-ft. antenna gives best results on broadcast band in crowded localities; for the short-wave band a 75-ft. length is better and may be used for both bands in areas remote from broadcasting stations.

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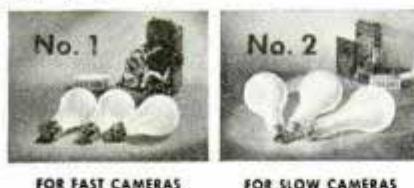
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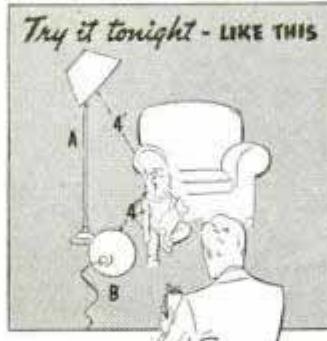
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GENERAL  ELECTRIC
MAZDA PHOTO LAMPS

Harnessing Radio's 'Baby Waves'

(Continued from page 372)

straight lines and are reflected from objects such as buildings, leaving "radio shadows" behind the buildings. One queer condition is the "chattering tree effect" which makes a conversation seem to chatter when the receiver is among trees.

An advantage of the micro-waves is that they can be concentrated into narrow beams. This is true for all wave lengths up to ten meters, making it possible to reduce station-to-station operating costs, but among the centimeter waves the beam effect is most pronounced.

A ten-centimeter conversation can be transmitted as a beam of not more than a yard in cross section, assuring absolute secrecy in point-to-point communication. An outsider who located the beam and placed apparatus in its path to listen in would reduce the signal strength at the receiving station, giving himself away.

How far down the wave-length scale can we go? For ordinary communication the limit appears to be around ten centimeters, although messages on a four-and-one-half centimeter beam have been transmitted six miles.

Below three or four centimeters is a shadowy band that separates radio and heat and about which practically nothing is known. Exploring into this band, Dr. G. W. Potapenko, of the California Institute of Technology, has generated and studied waves only one centimeter long, by far the shortest radio waves known.

Such extremely short waves require tiny radio tubes and Dr. Potapenko has had to devise tubes that make ordinary "acorn" and midget tubes look like monsters. Made by hand by C. Y. Meng, each tube has a plate only .07 centimeter long. The wire used in the grid is .0025 centimeter in diameter and the finished grid spiral is .08 centimeter long. The whole assembly is smaller than a housefly.

Aside from the power supply, five tubes are all that is used in the one-centimeter transmitter, there being no external coils or resistances. To simplify matters Potapenko inclosed the tiny units in a five-fingered "radio tree" vacuum tube.

No one can say what strange uses will be found for these waves. So far they

(Continued to page 152A)

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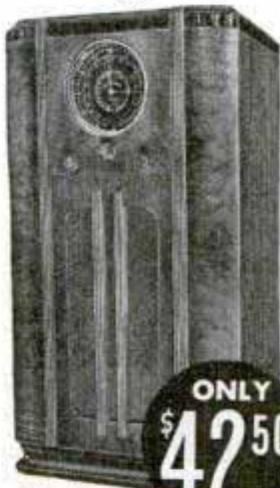
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153

(Continued from page 150A)

have been used chiefly for studying magnetic properties of metals and for learning more about molecular structure. Molecules seem to absorb or reflect the waves according to their sizes.

One use that holds promise is that of hardening metals. Soft steel acquires an extremely hard surface when held in the high-frequency beam for a few minutes. The hardening effect is only a few molecules deep, the depth depending upon the length of the exposure.

Hand in hand with the development of short waves have come improvements that permit packing a radio circuit with many messages similar to the way that dozens of conversations can be handled over the same telephone wires. In opening up a commercial three-meter circuit between New York City and Philadelphia last summer David Sarnoff, president of the Radio Corporation of America, declared:

"Now we find that the short-wave part of the radio spectrum gives us a medium of almost unbelievable possibilities. We not only can send messages in facsimile as fast as present equipment will allow, but we can send two pictures simultaneously, and on the same radio wave we can add two automatic typewriter channels and a telegraph channel."

By installing other equipment and additional automatic typewriters it would be possible to transmit 12,000 words per minute each way over the three-meter radio circuit. Direct communication between New York and Philadelphia would be unreliable on three meters, so two untended automatic repeater stations are used en route, one located at New Brunswick, N. J., and the other near Trenton.

The circuit is opened by transmitting a musical note. When this note is received by the first repeating station it automatically goes on the air, relaying the note to the next station and putting that one in operation. Incoming messages on one wave length are rebroadcast on a slightly different wave length so there will be no interference either way. Six wave lengths all close to the three-meter frequency are used in the circuit. "Christmas tree" and turnstile types of directional antennas are used to reduce the spread of the beams between stations, hence messages over the circuit are practically secret.

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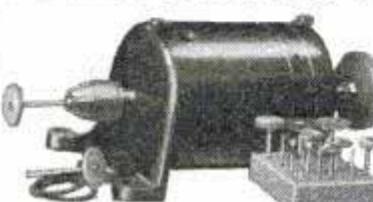
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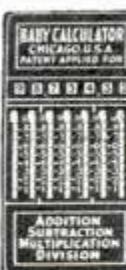
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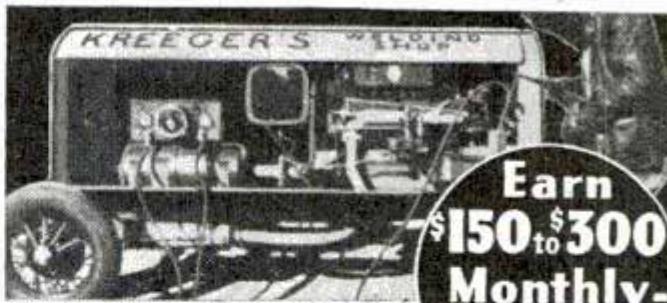
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Scrambled Voices

(Continued from page 343)

standard, or the declaration of an embargo, a boycott, or a bank holiday, immediately shows a rise in telephone calls.

The overseas service also has proved valuable to the press. It is now an established practice for London papers to call American sources for interviews or comments about events in the news. American reporters also frequently get scoops by telephone interviews with celebrities traveling on ships.

The overseas telephone is, of course, necessary for picking up foreign programs. In this wise, the voices of the world's foremost statesmen have come into American homes. Concerts, prize fights, earthquakes and speeches have also been wafted back and forth across the ocean. The flexibility of the overseas service was demonstrated by a recent program arranged by the National Broadcasting company for "Amos and Andy," famous radio stars, who separated for a vacation. "Amos" went to San Francisco, "Andy" went to London, and the announcer remained in New York. In order to broadcast on a simultaneous program, it was necessary for "Amos" to be in the San Francisco studio right after lunch, while "Andy" had to stay home until midnight, but for the announcer it was the usual evening broadcast hour.

Without leaving American soil, you can now reach more than 32,000,000 telephones, about ninety-three per cent of all the instruments in the world. Radio and wires have been combined to form the voice channels. American calls to Europe first pass through a central station in New York City, thence over a long wave and three short wave channels. The radio circuits connect with land-wire lines in Europe. If you make a call to Vienna, your voice travels over an invisible radio bridge to London, by submarine cable under the English Channel, and then by land-wire to Vienna. There are a number of important radio bridges leading from London. From this central station you can reach Iceland, Australia, Siam and South Africa. All of these connecting circuits are in the short-wave band.

Over the Atlantic, there are no convenient islands on which to locate repeater

(Continued to page 156A)

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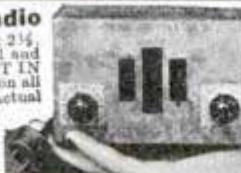
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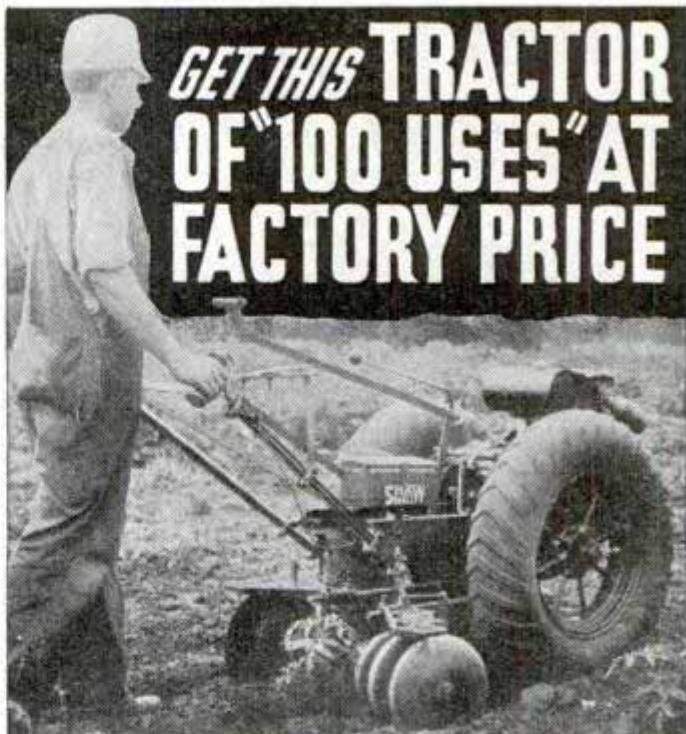
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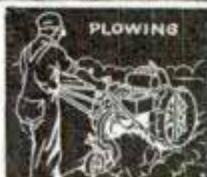
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B. C. Dog Food Co.,
346 State St.
Battle Creek, Mich.

"BATTLE CREEK HEALTH FOODS for DOGS"



(Continued from page 154A)

stations. The amplification of your voice must be supplied at the transmitting and receiving stations. This necessitates enormous amplification of radio power. Thirty water-cooled vacuum tubes, each with a power capacity of ten kilowatts, are employed in the final stage of the long-wave transmitter at Rocky Point, Long Island. The power behind your voice, whether you shout or murmur, is just a few milliwatts. When the transmitters get your voice they convert it into waves of energy which, if suddenly converted into sound waves, would shatter windows for miles around. Despite the punch given to your voice by the power tubes, it is a bare whisper of energy when it reaches a receiving station 3,000 miles away. While the amplification at the transmitter may have been a million times, the receivers amplify the signal more than a billion times. Diamond-shaped antennas are used at both transmitting and receiving short-wave stations. This simple arrangement of wires gives the same results as antenna arrays much larger and more complex.

Scrambling is one of the devices employed to protect telephone subscribers against radio eavesdroppers. A device in the central control room in the New York long-distance building can scramble your voice so it is undecipherable to eavesdroppers. There are various types of scrambling. One of the methods now used is an upside-down "scramble"—with this, the high note sounds low and the low note sounds high. In the case of music, for instance, the shrill fife sounds like thunder, while the kettle drums sound like squeaky machinery. The eavesdropper hears vowels and consonants utterly strange to any human ear, and it is this gibberish that travels the voiceways overseas.

The steadily increasing volume of overseas telephone traffic has resulted in a gradual decline in toll charges. When the New York-to-London service was opened, the charge for a three-minute conversation was \$75, with \$25 for each additional minute. The present price of a call between New York and England is \$21 for three minutes during week days and \$15 for three minutes during nights and on Sundays. From New York you can now speak to Japan for \$35. The same toll charge applies to the Union of South Africa.

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THE PLAN SHOP, 507 Palmolive Bldg., Chicago, Ill.



BATTERY METER

\$4.85 Now you can know your battery charge

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Smashing Atoms

(Continued from page 325)

segregated is with a mass spectrometer. Briefly, in this machine an element such as potassium is heated in a vacuum chamber. The absence of air permits a sort of evaporation of atoms from the surface of the potassium sample and these flying atoms are boosted to a speed of about one million centimeters per second by passing them through an electrical field. The speeding particles then enter a magnetic field that curves their lines of flight. Obviously, the radius of the curve depends upon the weight of the atom, since a light atom will be affected by the magnetic pull more than a heavy atom. That means all the potassium atoms having the same weight will land in one spot, while atoms of a greater weight will land in another.

Actual transmutation is done similarly. Positive ions are employed to bombard the atoms of an element. The ions themselves are merely unbalanced atoms of some other element, the choice depending upon the material being bombarded and the product desired. The ions are evaporated from a heated source and worked up to a terrific speed by using an electrical field of one million volts or more. Flying at top speed, the ions are directed at a target consisting of a small amount of the material to be transmuted. Some ions make direct hits on some of the nuclei on the target and when this occurs the nuclei join, thus forming the nucleus of a new element that gathers around it enough electrons to become a complete atom.

So far, transmutation is strictly a phenomenon of the laboratory. Changing one element into another is accomplished atom by atom instead of pound by pound. Enough material can be transmuted, however, to enable physicists to prove the transmutation. In one case enough helium was created out of atoms of another element to permit spectroscopic analysis.

From their study of the atom physicists have concluded there are not ninety-two basic elements after all, or even several hundred. Actually, the true building blocks of matter number less than half a dozen. At present these are thought to be the proton and neutron that compose the nucleus, the electron, and another minute electrical charge known as the positron.

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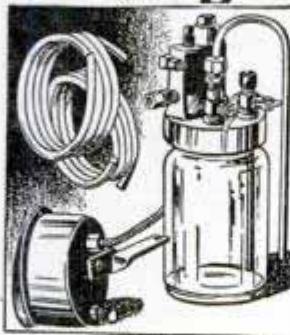
ACCORDING to an article by the president of the world's largest motor research corporation, there is enough energy in a gallon of gasoline if it were converted 100% in mechanical energy to run a four cylinder car 450 miles.

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produced in your own workshop allow you to design and build your own GASOLINE ENGINES, STEAM ENGINES, STANARY ART. OBJECTS, SPECIAL TOOLS, NEW INVENTIONS, ETC. You can also make forgings and case harden steel. Your shop is not complete without a FOUNDRYETTE. Three sizes are available capable of making bronze castings of 1 1/2, 3, and 8 pounds weight, aluminum, copper, brass, etc., in proportion to specific gravity. Clean scrap metal suitable for use.

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Above price includes Universal high speed blower. For low speed blower good on

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INVENTORS

Be Sure to See Page 23A

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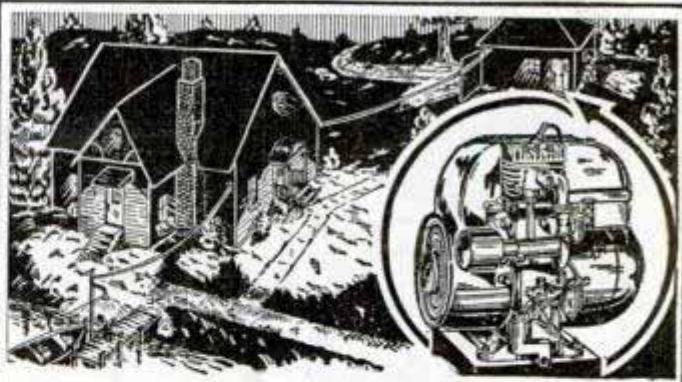
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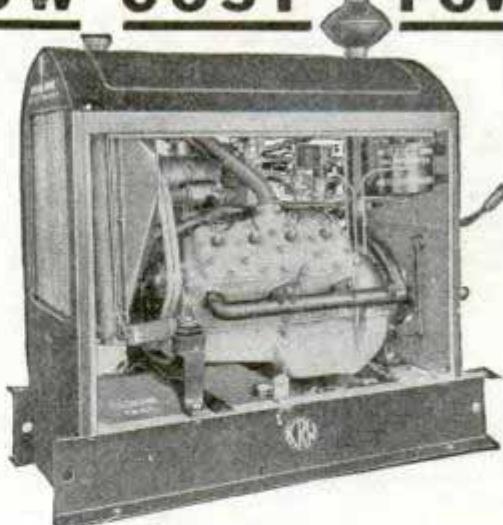
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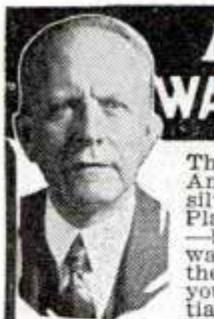
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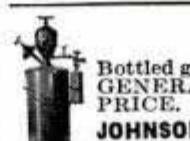
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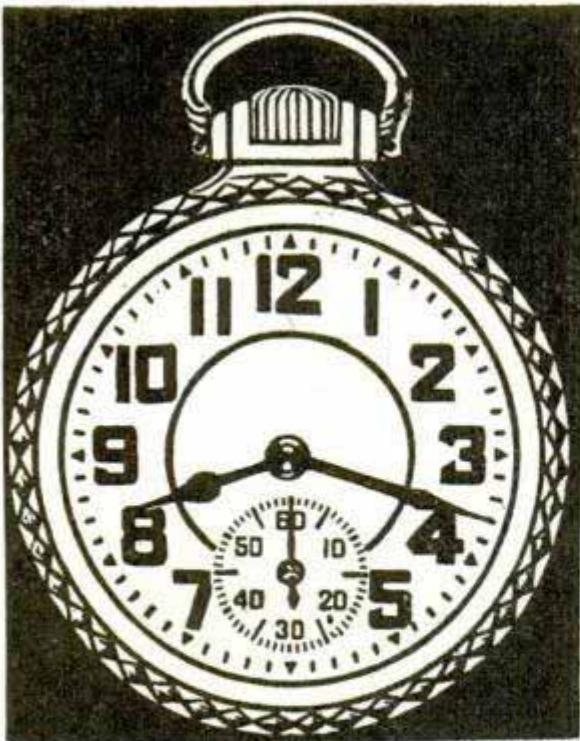
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CORONA

America's finest portable typewriter

If you've ever wanted to "own a Corona" now's the time! School or literary work, business, or home correspondence... Corona handles it all. You can pay for it as you use it—as little as \$1.00 a week takes a Corona home with you. Ask your dealer—or write for free booklet. Four models to choose from.

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Water Sprayed on Auto Wheel Prevents Shock from Static



Pictures, one.

Water spraying on wheels of cars approaching bridge tollhouse releases static electricity charge

When toll collectors on New York's Tri-borough bridge reached for the fare, both the tollman and the car driver were annoyed by the discharge of static electricity produced by cars moving over the bridge. The problem now has been solved by installing a water spray which spouts onto the wheels of cars approaching the tollhouse, releasing the static charge before the cars reach the tollkeeper.

T1690 Is Shaken with a Finger

Agitator for Developing Tank

Instead of shaking the film developing tank by hand, an agitator recently put on

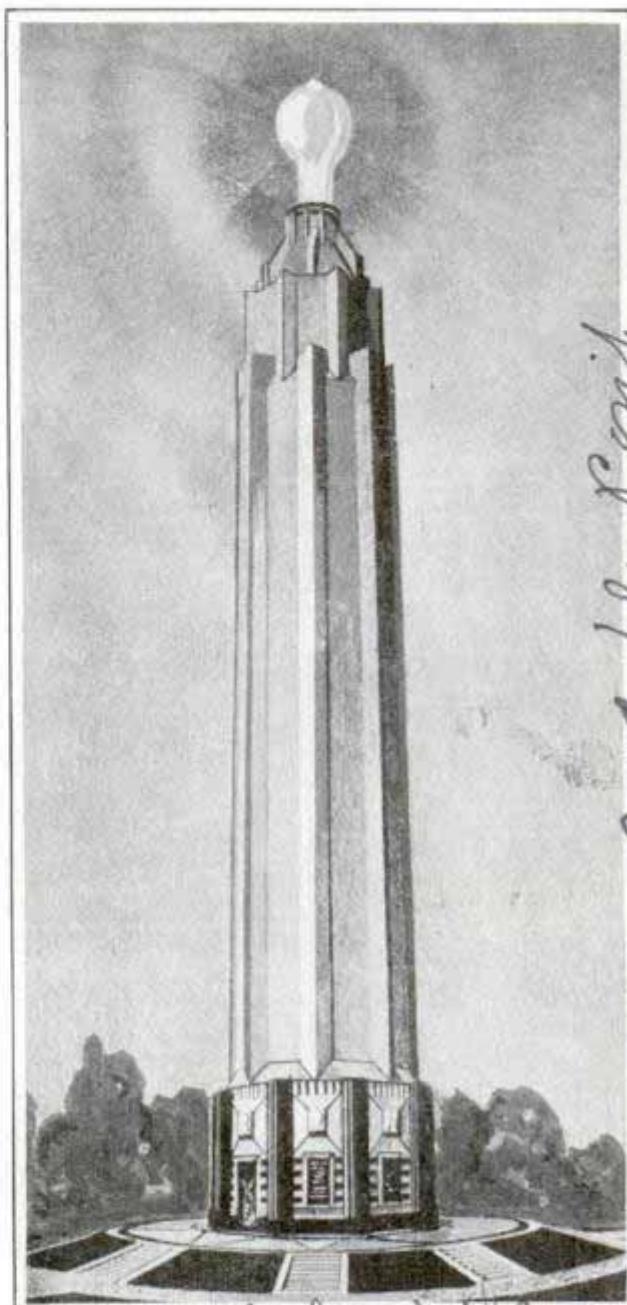
the market requires only a slight finger motion. It is a metal disk about four inches in diameter, rubber-coated on one side to keep the developing tank from slipping, and fitted with a small convex dome on the other side. The tank is placed on

the flat side and rocked with a finger in a circular motion which distributes the developing solution uniformly over the film.



T1668.

Tower with "Eternal Light" to Honor Edison



Wide World
Design of memorial shaft, topped by "eternal light," which will honor Thomas Edison

Topped by an "eternal light," a giant shaft is proposed as a memorial to Thomas A. Edison. The memorial will be erected by the Edison foundation and the Edison Pioneers. A design of the proposed light tower has just been completed by a firm of Wilmington, Del., architects.

Popular Mechanics Magazine does not publish the name of the maker of, or dealer in, any device described in its pages, but this information will be furnished by our Bureau of Information upon request, accompanied by stamped envelope.

*The Central Camera Co
230 S. Wabash Chicago*

marsena and her son

*"I'd forget your
age, Old Boy—*

**...if you had a
Barbasol Face"**

It takes more than a clean, smooth shave to make a lovely lady yearn to draw her hands along your manly jaw.

It takes a "Barbasol Face"—a soft, firm skin, kept young and handsome looking by the soothing, after-shaving effects of Barbasol.

Throw away old shaving methods. Try a tube of Barbasol for two solid weeks and see how the years appear to roll off your face.

Barbasol is a cream—no harsh alkalis in it to dry and tighten the skin, to hurry on the wrinkles long before your time.

No brush, no lather, no rub-in



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Are you good at guessing? If you are you may win any one of the valuable prizes given away every week—a new automobile, big money prizes, hundreds of \$3 Barbasol Razors. Absolutely free to enter, takes only a few seconds to do. Simply guess a number, that's all. For details, tune in Singin' Sam (NBC Blue Network) every Friday evening. See your paper for time.

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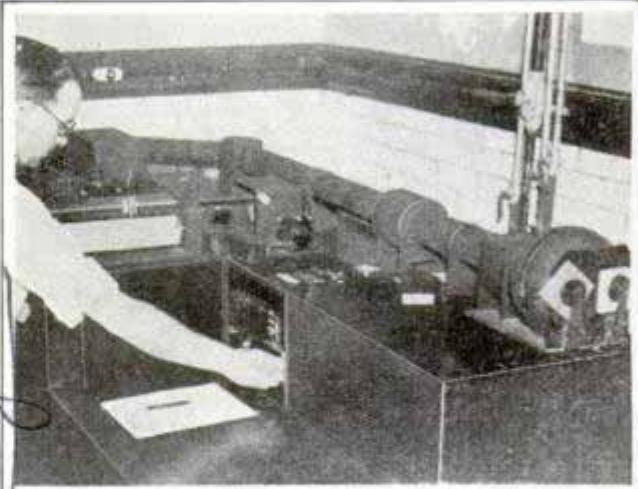
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15 POUNDS \$44

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Here is the lightest, handiest, slickest little motor that any fisherman, cottager, vacationist ever dreamed about . . . and, complete, ready to go, it costs only \$44! Drives good sized boats up to 5½ miles an hour! Uses only a single quart of fuel in 1½ hours . . . 100 miles of carefree water motoring for less than 60 cents! Write today for catalog on the 15 lb. Scout and brilliant new Evinrude Streamflow models for 1937. Address, EVINRUDE MOTORS, 5015 N. 27th St., Milwaukee, Wisconsin.

EVINRUDE SEND FOR CATALOG



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Analyzing the color of a bit of cloth with the spectrophotometer at the Bureau of Standards

It used to take a man a half day to test the colors in a piece of cloth. Today the same work is done by a spectrophotometer at the U. S. Bureau of Standards in just five minutes. The meter records the percentage of light transmitted or reflected at various wave lengths in the visible spectrum.

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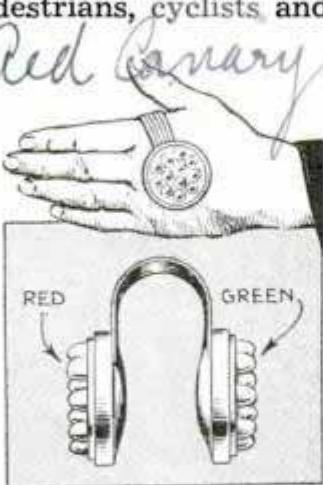


645 Avenue A. Rochester, N.Y.

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Spring tension can be increased by pressing the reflectors together, thus insuring a better fit on the wrist or hand. The signal may be worn over gloves.



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PAYS BIG!

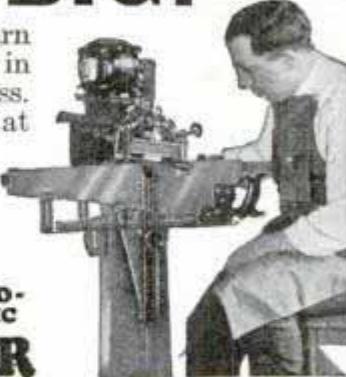
An opportunity to earn up to \$2 to \$3 an hour in your own cash business. Start in spare time at home. No experience required. You can do expert work...easily, quickly, without eye-strain, with a

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SPOSE, THAT MEANS ME—BETHE COULDN'T DO ANY BETTER IF HE HAD THE BIG BLOSSOM I'VE GOT BESIDE MY MOUTH—GOSH! IT HURTS EVERY TIME I BLOW A NOTE!

FOR GOODNESS SAKE PAUL—WHAT'S GOT INTO YOU LATELY—I NEVER KNEW YOU TO SIT AROUND HOME THIS WAY—DON'T YOU FEEL WELL?

OH—I'M ALL RIGHT MUM—ONLY WELL—A GUY DOESN'T MUCH LIKE GOING AROUND WITH A PIMPLY FACE LIKE THIS!



"THE WAY I LOOKED BEFORE I took Fleischmann's Yeast. I hated going anywhere, my face was so broken out."

PAUL NOW—PIMPLES GONE. "Fleischmann's Yeast sure cleared up my skin fine," he says.

I'm mighty glad to tell others about what a well pimpled class Fleischmann's Yeast is. Every boy that wants to get rid of pimples ought to eat it.

Paul S...



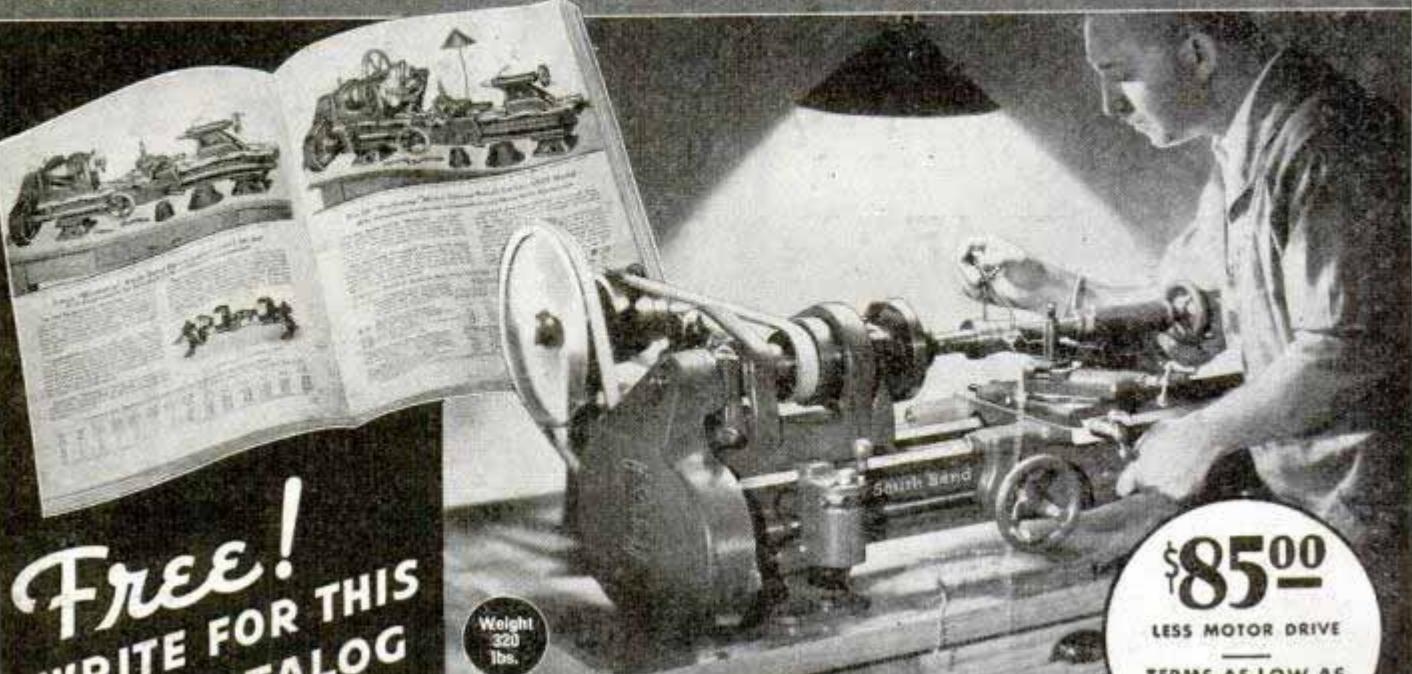
CLEAR'S UP ADOLESCENT PIMPLES—After the start of adolescence, important glands develop. This disturbs the entire system. The skin gets oversensitive. Waste poisons in the blood irritate this sensitive skin. Pimples appear. Fleischmann's Yeast helps to clear up pimples by clearing these skin irritants out of the blood.

Eat 3 cakes a day—a cake about one-half hour before each meal—plain, or in a little water.

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New 1937

SOUTH BEND
Back-Geared Screw Cutting
PRECISION LATHES



FREE!
WRITE FOR THIS
NEW CATALOG
15 K

Weight
320
lbs.

No. 415-YA 9 $\frac{1}{8}$ " swing by 3' bed Workshop Bench Lathe with Horizontal Motor Drive, $\frac{1}{4}$ h.p. Reversing Motor, Switch and belt tension countershaft as shown above \$116
(\$29 Down, \$8 a month for 12 months)

\$85.00
LESS MOTOR DRIVE
TERMS AS LOW AS
\$7.00
A MONTH

THE new 1937 model 9-inch Workshop Lathe is a Back-Geared Screw Cutting Precision Lathe, with Twin Gear Reverse to lead screw, Ball Thrust Bearing on Spindle, Longitudinal Screw Feed to Carriage, Precision Lead Screw for cutting screw threads—and scores of other important features.

Especially recommended for fine accurate work in the plant, shop and toolroom. Used by all important industries in this country and abroad. Takes 38 practical attachments for milling, grinding, draw-in collet chuck work, and many other manufacturing jobs.

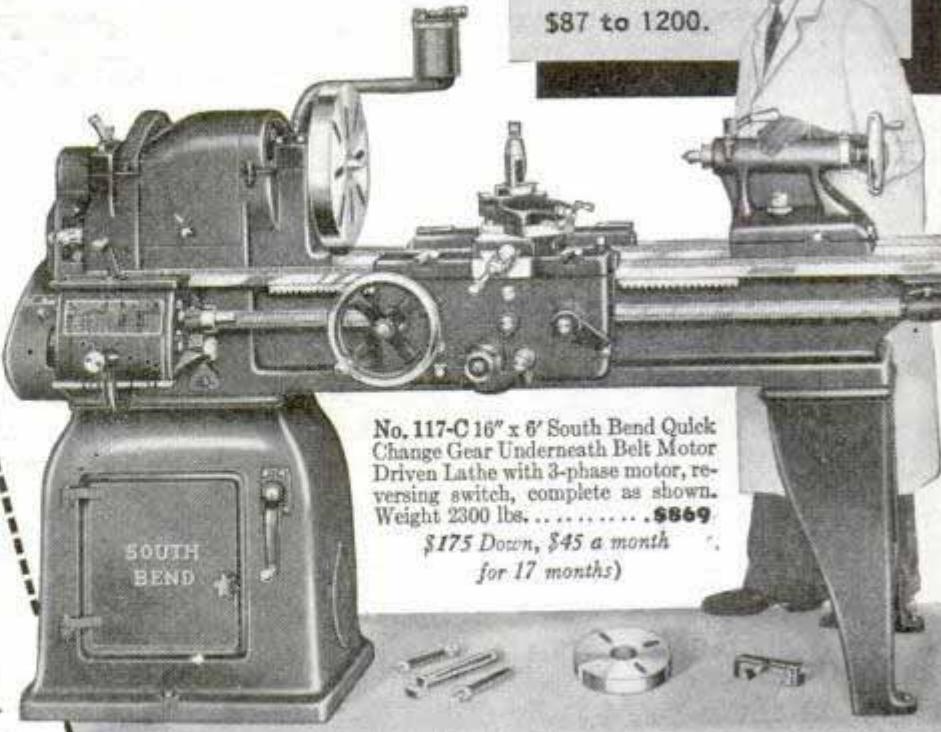
Write for Catalog 15K, illustrating and describing the new 1937 Model Workshop Lathe in 8 different drives—4 bed lengths. Shows the 38 attachments for use with this lathe. A valuable booklet to anyone interested in metal working lathes.

Use coupon below.

SOUTH BEND LATHE WORKS

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South Bend, Ind., U.S.A.

South Bend Lathe Works,
615 E. Madison St.,
South Bend, Ind. U.S.A.
Please send me your new 1937 Catalog
15-K.
Size of lathe interested in
Class of work
Name
Address
City State



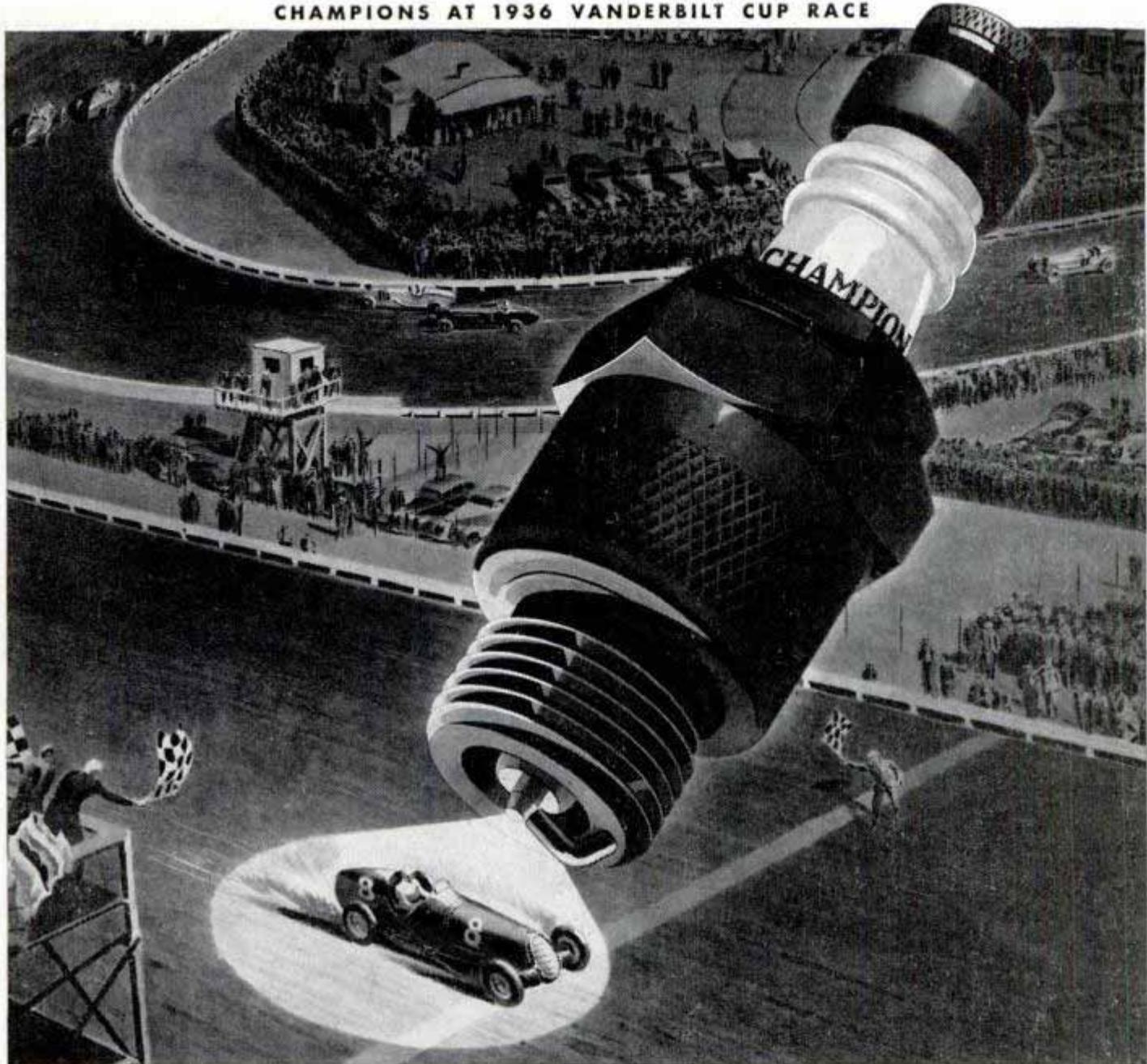
No. 117-C 16" x 6' South Bend Quick Change Gear Underneath Belt Motor Driven Lathe with 3-phase motor, reversing switch, complete as shown. Weight 2300 lbs. \$869

\$175 Down, \$45 a month
(for 17 months)

5 OTHER SIZES
9", 11", 13", 15", 16"
SWING.
IN ALL BED
LENGTHS
PRICED
\$87 to 1200.

SOUTH BEND Precision LATHES

CHAMPIONS AT 1936 VANDERBILT CUP RACE



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YOU CAN DEPEND ON CHAMPIONS

● Buying the best spark plugs and keeping them always in good condition, is cheap insurance of dependable acceleration. You can depend on Champions to give your engine faster acceleration, more power, speed and dependability. Champions have a unique record in this respect, having equipped the winning engines of practically every racing event throughout the world for the last 13 years. The recently revived Vanderbilt Cup Race inaugurating the new Roosevelt Raceway, pictured above, was won by Nuvolari, Italy's premier race driver. Acceleration was the determining factor and the winner, as well as eight out of the first ten, relied on Champions. Demand Champions for your car.

THE
SPARK PLUGS
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For Digestion's Sake... Smoke Camels

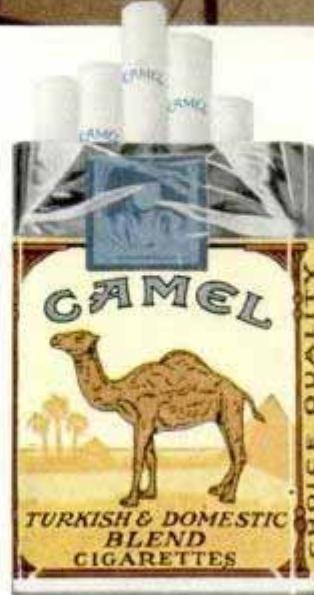
"I'll back that to the limit," says Miss Dorothy Kilgallen, spunky globe-circling girl reporter

AROUND THE WORLD IN 24 DAYS. "It was a breathless dash," said Miss Dorothy Kilgallen, famous girl reporter, back at work (above) after finishing her assignment to circle the world by air in record-breaking time. (Right) Her exciting arrival at the Newark Airport. "I snatched meals anywhere," she says, "ate all kinds of food. But Camels helped me keep my digestion tuned up. Camels set me right. I'll back them anytime for mildness and flavor."



IN every job—reporter or housewife, explorer or laborer—tension and upsets are to be expected. Healthy nerves and good digestion enable you to glide over trying incidents and get the full enjoyment out of working, eating, and playing. No wonder that so many who make their mark in the world today are steady Camel smokers!

At mealtimes—enjoy Camels for the aid they give digestion. By speeding up the flow of digestive fluids and increasing alkalinity, Camels contribute to your sense of well-being. Between meals—get a "lift" with a Camel. They don't get on the nerves, or irritate the throat. Camels set you right!



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